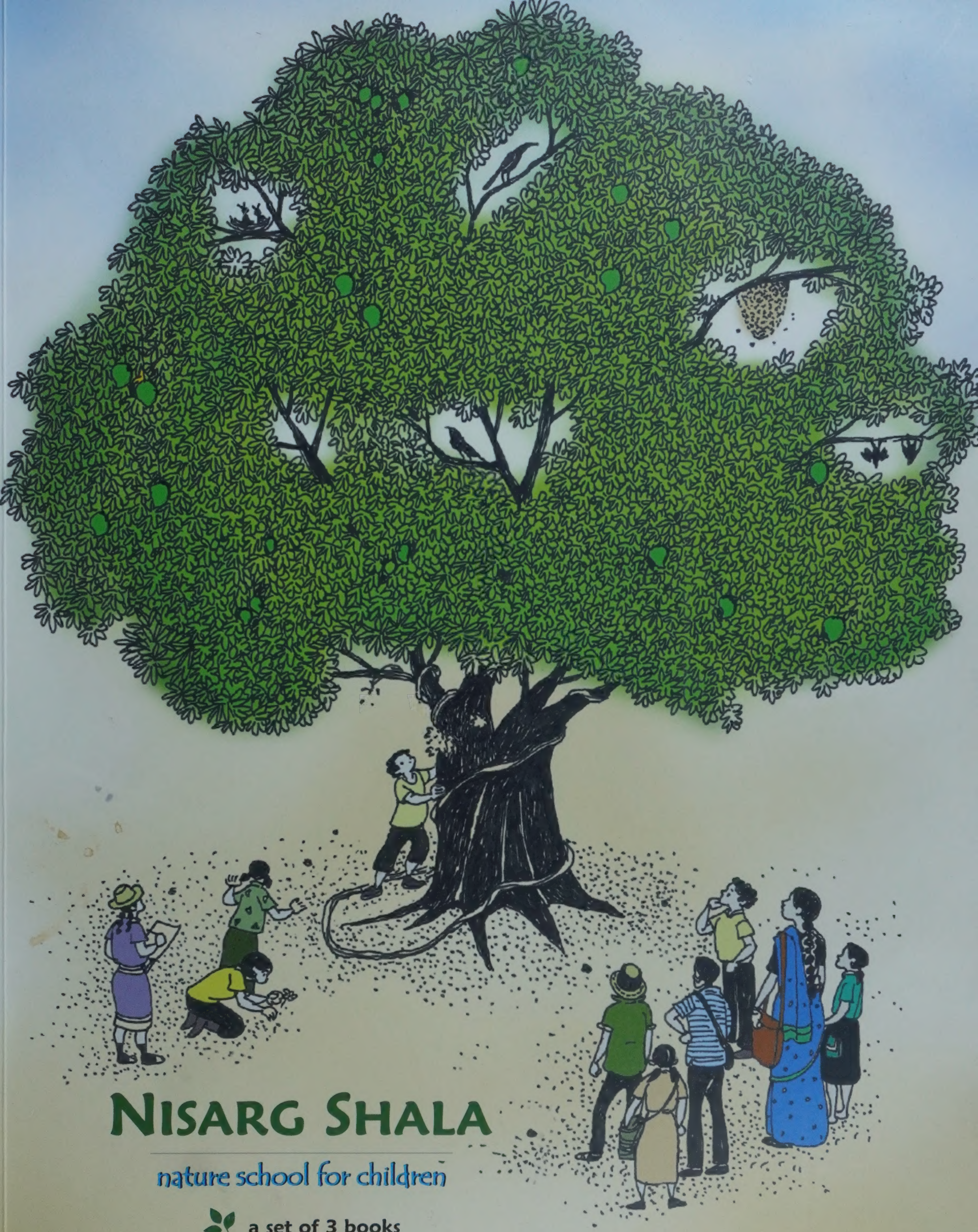

NISARG SHALA

nature school for children

a set of 3 books

Part 3

Nisarg Shala

nature school for children

Part 3

Manual for Teachers and Parents
Eco-activities for Children

This set of 3 books can be used for
an Environmental Education Programme
for students aged 10, 11 and 12 years
(Standards 5th, 6th and 7th)

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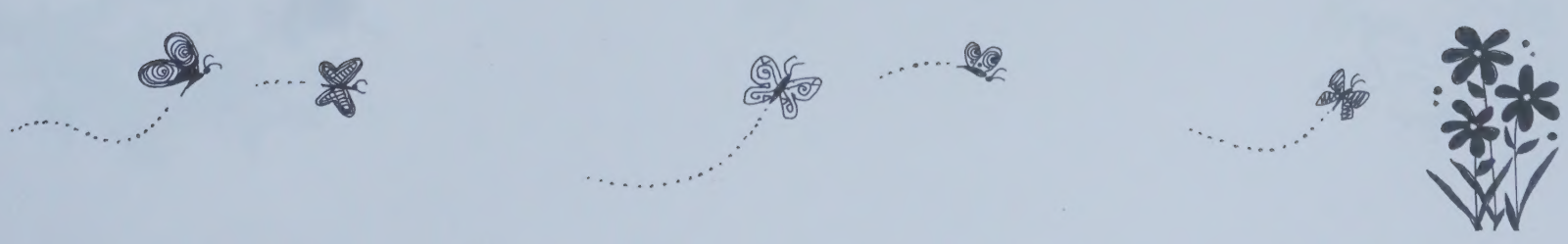
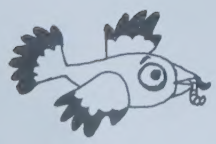
Nisarg Shala – Part 3

Age – 12 years (for 7th standard)



About the Book

- This is the Part 3/Book 3 from the set of books "Nisarg Shala".
- Read the preface and other instructions from the Part 1/Book1 before using this book.
- Though this book is for the students who are 12 years of age (for standard 7), it is advisable not to use this book without first completing all the activities from Parts 1 and 2, since some activities have been planned with a conceptual progression for clear comprehension of the concepts. The students will be able to learn and understand better if this progression is followed.
- Alternatively, a condensed module of about 25 activities can be taken up for a shorter duration. Details can be found on the last page.



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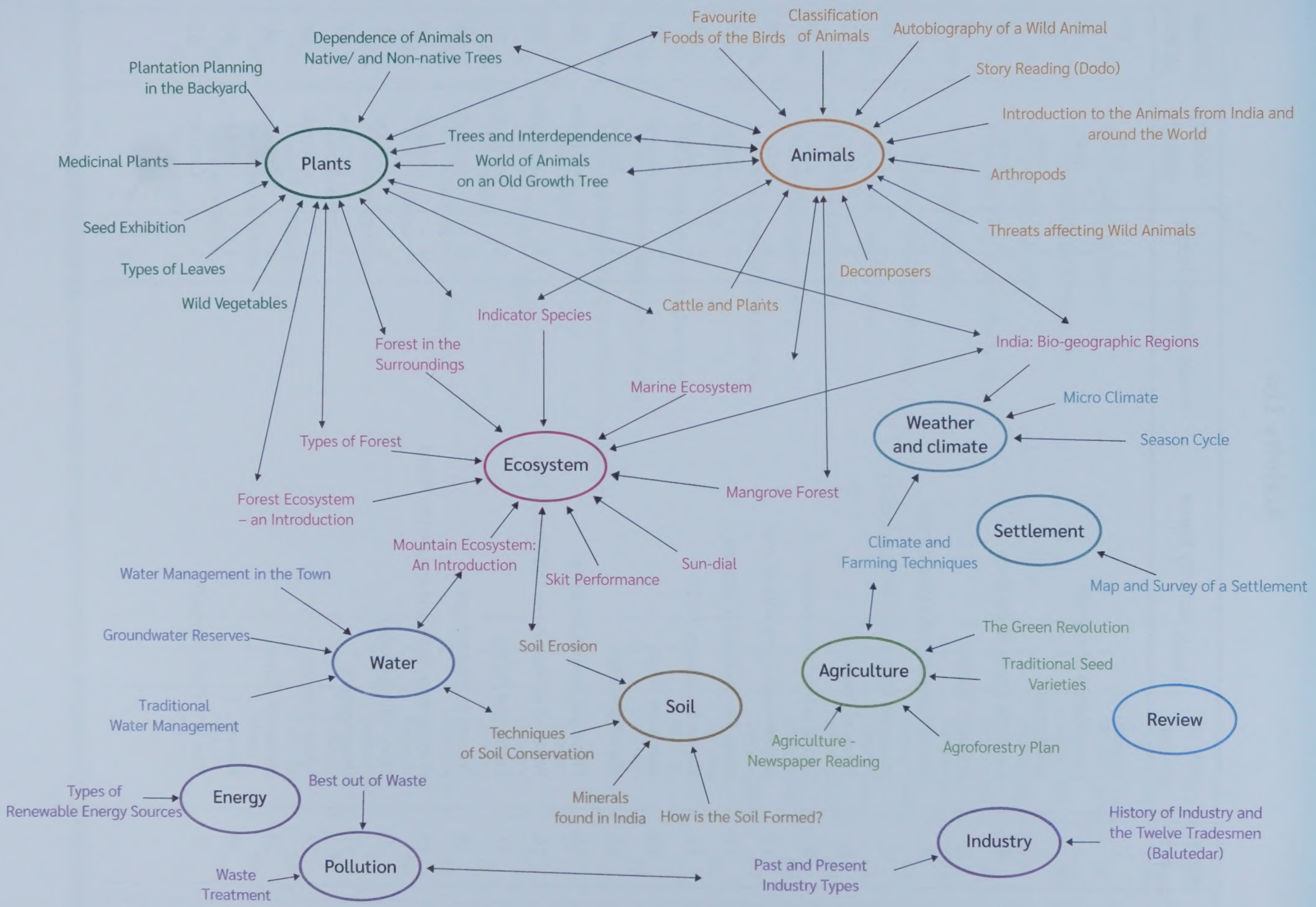
Units of the Activities

- Plants
- Water
- Animals
- Ecosystem
- Soil
- Agriculture
- Weather and Climate
- Energy
- Settlement
- Pollution

Co-relation Between the Activities



Activity List

Activity No.	Activity Name	Hours	Activity Month	Page Number
1.	Sun-dial	1	June	8
2.	Classification of Animals	1	June	10
3.	Arthropods	1	June	12
4.	Favourite Foods of the Birds	2	June	14
5.	Indicator Species	1	July	15
6.	Forest Ecosystem: An Introduction	2	July	17
7.	Mountain Ecosystem: An Introduction	2	July	19
8.	Types of Forest	1	July	21
9.	Forest in the Surroundings	1	July	23
10.	Autobiography of a Wild Animal	1	July	24
11.	India: Bio-geographic Regions	2	August	25
12.	Marine Ecosystem: Part 1	2	August	29
13.	Mangrove Forest	2	August	31
14.	Wild Vegetables	1	August	33
15.	Trees and Interdependence	2	September	34
16.	World of Animals on an Old Growth Tree	2	September	35
17.	Cattle and Plants	2	September	37
18.	Threats to Wild Animals	1	October	38
19.	Animals from India and around the World	1	October	39
20.	Story Telling (Dodo)	1	October	45
21.	Decomposers	1	October	47
22.	Types of leaves	1	October	48
23.	Medicinal Plants	1	October	49
24.	Review - 1	1	October	50
25.	How is the Soil Formed?	1	October	52

Activity No.	Activity Name	Hours	Activity Month	Page Number
26.	Groundwater Reserves	1	November	54
27.	Traditional Water Management	1	November	56
28.	Climate and Farming	1	November	57
29.	Plantation Planning in the Backyard	1	November	59
30.	The Green Revolution	1	December	60
31.	Agriculture: Newspaper Reading	2	December	61
32.	Traditional Seed Varieties	2	December	62
33.	Minerals found in India	1	December	63
34.	Marine Ecosystem: Part 2	1	December	66
35.	Map and Survey of a Settlement	2	December	67
36.	Season Cycle	1	January	69
37.	Water Management in the Town	2	January	71
38.	Types of Renewable Energy Sources	1	January	73
39.	History of Industry and the Twelve Tradesmen (Balutedar)	1	January	75
40.	Past and Present Industry Types	2	January	77
41.	Soil Erosion	2	January	78
42.	Soil Conservation Techniques	2	February	80
43.	Micro Climate	1	February	82
44.	Agro-forestry Plan	1	February	84
45.	Seed Exhibition	2	February	85
46.	Waste Treatment	2	February	86
47.	Best out of Waste	2	March	88
48.	Skit Performance	2	March	89
49.	Review- 2	1	March	90

Important Instructions for the Field-visits

The teacher should find out information and try to visit the following sites near the school before starting the programme.

- River / streams
- Catchment areas
- Wilderness areas in the Village/town/city

Please give the following instructions to the students before every field-visit -

- Everyone must wear proper shoes while going on a field-visit.
- Watch out for thorns, insects etc. while walking on the field. Also, be careful while walking through the tall grass. Follow the 'path' to avoid snake or scorpion bite.
- Wear camouflaging clothes that are matching to the colours in the nature and avoid bright coloured clothes.
- Do not enter into thickets or pluck the leaves or the flowers without the teacher's permission.
- Do not run around and wander away from your group.
- Maintain silence while watching birds.
- Finish the observations in the stipulated time and return to the predetermined place (recognised assembly point) as instructed.
- Use the binoculars / magnifying glasses carefully and share them with others.
- Things to carry on a field-visit: a cap, an umbrella, a water bottle, a notebook, a pen, a pencil for noting observations.
- Carry the field guides for such visits if available in the school library.

Extra Reference Material

*Additional reading is necessary for some of the activities in this book. In the interest of space, it is difficult to give all the information here, so we have placed it on the website below. It has slide shows, images, videos, reading material etc. Please download, read and use those as per instructions given.

Study the coloured maps provided on the website for the activities with maps. If possible, take coloured photocopies of these maps for the students. Show the coloured photographs of the birds, the animals and the plants that are also available on the website.

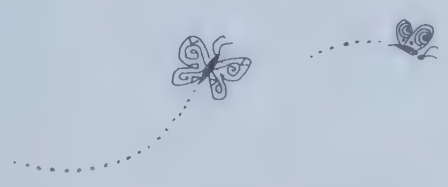
https://www.adhiwas.org/nisargshala

List of Activity Material (for the entire year)

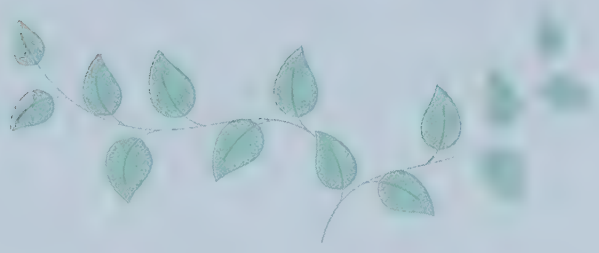
- Photographs/sketches of the Arthropods
- 30 cm x 30 cm Cardboard
- Small stones
- 12 inch scale/ruler
- Binoculars (3), magnifying glass (3)
- Measuring tape / Meter tape
- Photographs of Orchids and Epiphytes
- World map
- Map of the Minerals found in India (metals and non metals)
- Image/photograph of Mangroves
- Thermometer
- Hygrometer
- Colour pencils / crayons
- Local newspaper /article about agriculture
- Shovel, small cutting tool like sickle or trowel
- Large plain papers
- Graph papers
- Containers/holders made of leaves
- Old newspapers
- Photocopy of the map of the biomes of India
- Colours, paint brushes
- Water
- 5-6 small utensils
- Glue/library paste
- 5-6 pairs of scissors
- Images of animals
- 5-6 cello tapes
- Cardboard from old notebooks
- Map of Maharashtra and India (physical/natural and political)
- Photocopies of the images of the marine biodiversity
- Wheat flour waste from the flour mill
- Thin and straight bamboo or wooden stick or a pencil
- Wildlife map of the India and the world (photocopy)
- Copies of the map of India showing the borders of the states, for all the students
- Teachers should ensure that students carry their notebooks, pens, pencils when required for the activities.

Note for the drawing teacher - The subject teacher should get the required illustrations sketched from the drawing teacher on the board before the activity or drawn on a large chart paper with a mount board support and kept in the school permanently for the following activities.

- Arthropods
- India: Bio-geographic regions / Biomes
- Introduction to the traditional planning and management of water



Activities



1 Sun-dial

Outdoor

Unit

Ecosystem

Activity Duration

1 hour

Activity Month

June

Method

Activity, discussion

Material

A cardboard sheet of 30cm x 30cm, a 12cm long thin and straight bamboo or wooden stick or a pencil, notebook, pen, pencil, pebbles, pair of scissors, 12 inch scale

Instructions for Teachers

- Read about the summer solstice and the winter solstice from the website link provided for additional information before the activity.
- Identify a place in the school premises, for placing the Sun-dial which gets ample sunlight through the course of the day.

Activity

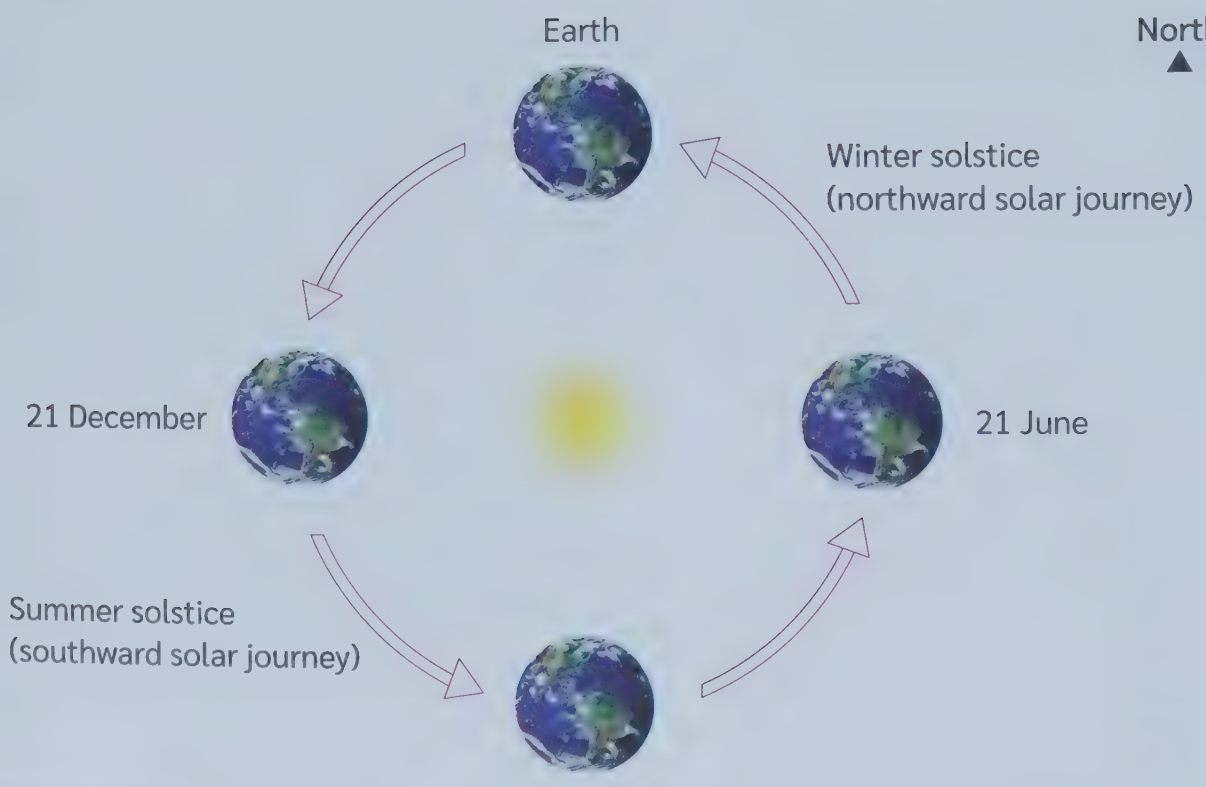
- Take the students to the pre-identified place in the school campus, ask them to stand in a circle. Tell them the name of the activity and ask them some leading questions, for example, have they observed how their shadow falls on the ground? Is the shadow the same in the morning, afternoon and evening or does it change?
- After the discussion, ask one of the students to stand in the middle of the circle and ask the others to observe how his/her shadow falls on the ground. Then tell the students that they are going to perform an experiment of measuring a shadow.
- Now show the cardboard sheet to the students, punch a hole just below its centre and place it on a flat surface. (If needed, place pebbles on the 4 corners of the sheet). Insert the pencil or the wooden stick in the hole. Write the names of the 4 directions on the sheet and ask the students to observe the shadow of the stick falling on the cardboard sheet. Ask 2 students to mark the point at which the shadow ends with a pen. Now ask them to draw a line joining this point to the base of the stick with a pencil and a scale.
- Ask them to place the cardboard sheet in the same place every time (mark a spot for the same) and ask the students to measure the shadow and draw such a line after every 15 days, in the morning between 10:00 and 11:00. Ask them to note the date (month) and time without fail.
- Inform the students that they have to perform this experiment through the entire year.
- At the end of the year, place this cardboard sheet in front of the students, ask them to observe the lines on it and what they infer from the lines. Discuss with the students why changes are seen in the shadow. Explain to them the concepts of the summer solstice and the winter solstice.
- Find out **zero shadow day** and time for your region. Zero shadow day is on which the Sun does not cast a shadow of an object at noon. Take observations of the sundial on that day as well. Also take the students in the school ground or terrace before noon on the zero shadow day, ask them to hold hands and make a round and observe the (zero) shadow.

Objectives:

To introduce the students to summer solstice and winter solstice by observing the changes in the shadow of the Sun for the whole year

Sun-dial

Summer Solstice and Winter Solstice



2 Classification of Animals

Indoor

Unit

Animals

Activity Duration

1 hour

Activity Month

June

Method

Chart

Material

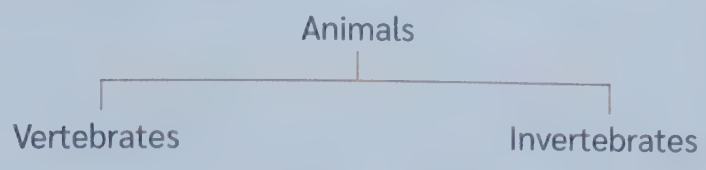
Notebook, pen

Instructions for Teachers

- Classification is an important step for understanding the biodiversity around us. Considering the range of this biodiversity, the teacher should read about this topic and its examples as much as possible.
- Refer to the website link provided for additional information.

Activity

- Revise the activity 'Classification of Animals' from the Book 1.
- Ask the students to name each category of the animal classification with examples.
- Draw the following chart on the blackboard:

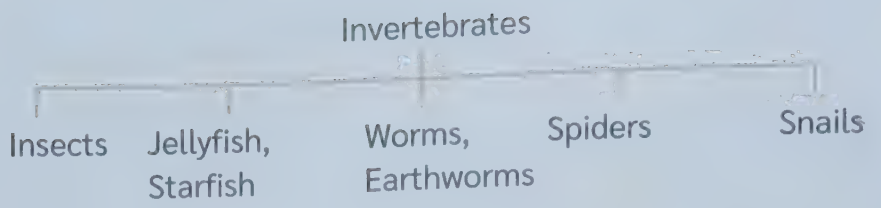


- After drawing this chart, ask the students the meanings of the terms 'Vertebrates' and 'Invertebrates'. Tell the students that 'Vertebrates' and 'Invertebrates' is the primary classification of animals.
- Ask the students to name all the sub-categories of 'Vertebrates' that they have learnt and write them on the blackboard.

- Connect this chart to the earlier one and ask the students to give examples of each of these categories.
- Ask the students to name the animals that they have learnt about under the 'Invertebrates' category and write them in the chart of the 'Invertebrates' in the similar manner. The chart on the blackboard should be like the one shown on the next page.
- After writing the classification, ask the students to read it.
- Write one example of each of these categories and tell the students about where these animals can be found.
- Ask the students to copy this chart into their notebooks.
- Explain that the animals grouped under one category have similar characteristics, life cycles and reproduction. Engage them in a discussion about this.
- Discuss with the students in detail - **the evolution of animals in nature was in a certain order.** The first ones to evolve as per the stages in the evolution were the aquatic animals, like the fish, then the amphibians, then the reptiles and the mammals, then the birds evolved from the reptiles.

Objectives:

To help the students study the classification of animals in detail



Additional Information for the Teachers

Evolution of the Animals on the Earth -

- 4.6 billion years ago, the Earth was formed.
- 3.5 billion years ago, the unicellular organisms were the first to be formed in the ocean. The organisms who could perform photosynthesis evolved and Oxygen was released in the air as a result of the process.
- 555 million years ago, the multicellular organisms were formed in the ocean.
- 500 million years ago, after the invertebrate animals, the vertebrate fish were formed.
- 450 million years ago, the arthropods were formed, and they started dwelling on the land. After that, the scorpions, the spiders and the centipedes were formed.
- 420 million years ago, the vegetation on the land was formed, various habitats were formed, and it changed the appearance of the earth entirely.
- 360 million years ago, the vertebrates and the four-legged animals started coming to the land gradually and started living in the habitats created by the plants. The corals were formed in the oceans.

3 Arthropods

Indoor

Unit

Animals

Activity Duration

1 hour

Activity Month

June

Method

Drawing, observation

Material

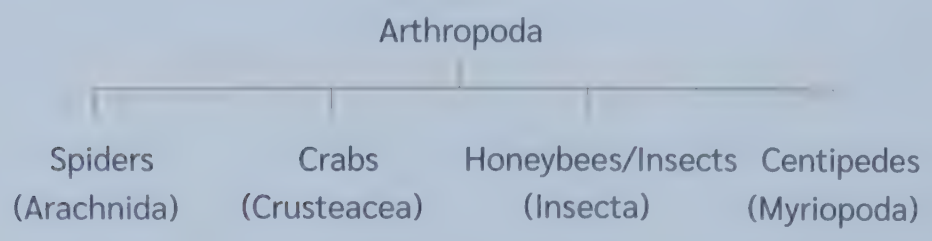
Photo/sketch, notebook, pen

Instructions for Teachers

- Study the subgroups of the animal class 'Arthropoda' (commonly known as Arthropods) and their characteristics.
- Collect pictures of one animal (and the names of their organs) belonging to each subgroup of the class 'Arthropoda'.
- Before conducting the activity, draw the classification chart of 'Arthropoda' along with these pictures/sketches on the blackboard. For example, spider, crab, fly/ butterfly, centipede. Take help from the drawing teacher for the drawings.

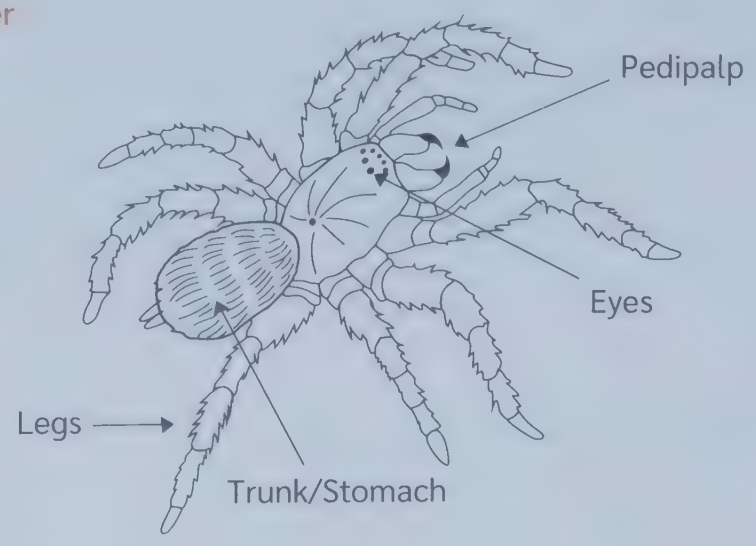
Activity

- Write **'Animals with Jointed Legs'** on the board and ask the students to give examples.
- Now write **'Arthropoda'** on the board and tell them that **'arthro' means 'joint' and 'poda' means 'legs'.**
- Take a quick revision of the activity 'Classification of the Animals' and connect it with Arthropoda.
- Now, write the classification chart for 'Arthropoda' on the blackboard with examples.



- Ask the students to name the animals that they have seen from the above categories and to describe them. For example – How many legs do they have? Where are they found?
- If possible, catch a big ant in a transparent bag or in a small box and ask the students to observe its organs.
- Then ask them to observe the sketches drawn on the blackboard and explain each organ of the animals.
- After this discussion, ask the students whether they can think of more examples of each subgroup.
- There are several types of insects. Ask the students to name them and write the names in the chart. For example – fly, wasp, beetle, bumblebee, praying mantis, bagworm, spittlebug.

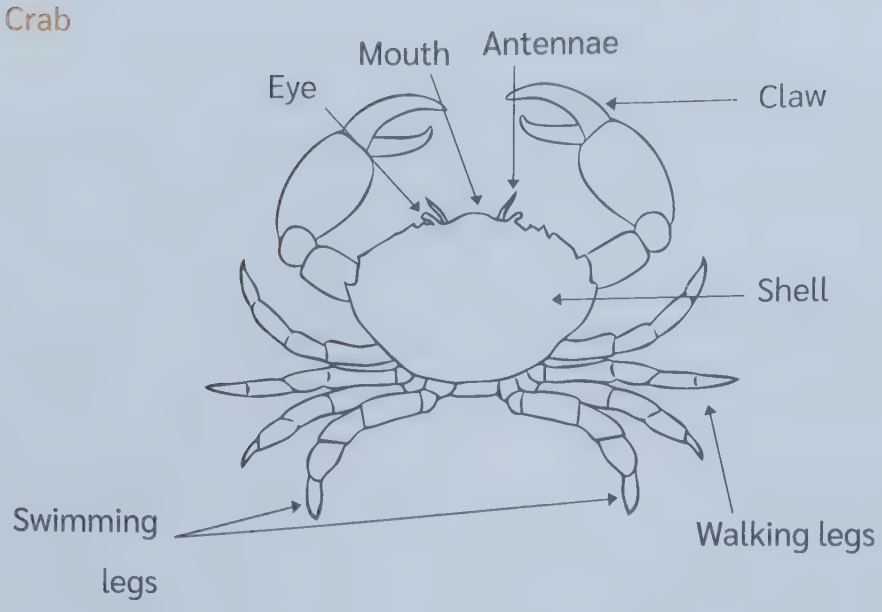
Spider



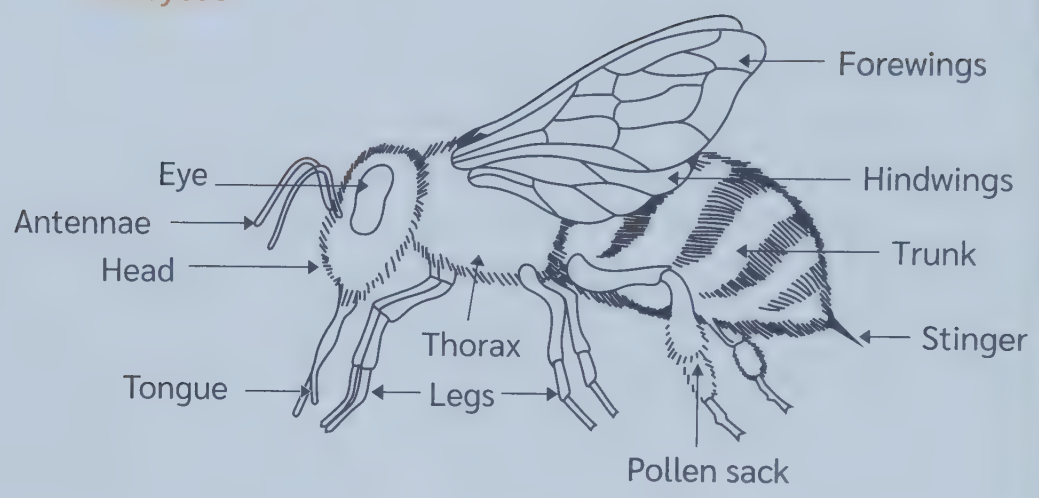
Objectives:

To help the students understand the class 'Arthropoda' from the classification of 'Invertebrates', as one can see the animals of the class 'Arthropoda' easily around oneself

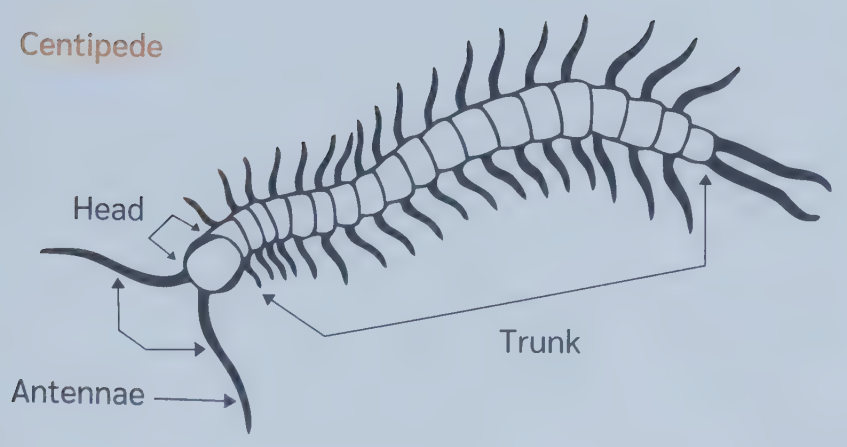
Crab



Honeybee



Centipede



4 Favourite Foods of the Birds

Outdoor

Unit

Animals

Activity Duration

2 hours

Activity Month

June

Method

Observation

Material

Notebook, pen, binoculars (if available)

Instructions for Teachers

- The chances of sighting the birds are higher in the mornings and the evenings. Therefore, plan the visit from 7 am to 10 am or 4 pm to 6 pm.
- If there is vegetation in the school campus, conduct this activity there. If not, then conduct this activity in a nearby park or in a place with vegetation.
- If the school library has any books on birds, carry them with you for the activity.

Activity

- Ask the students to name the birds that they see around their house/school.
- After all the students have answered, tell them that they have to observe any one bird thoroughly (in detail) in this activity.
- Then take the students out to the school campus or to a nearby park/place with vegetation for birdwatching.
- Ask the students to note the following points during the observation:
  - Name of the bird (if not known, write the description)
  - What does it feed on?
  - Generally, how many fruits/nectar/insects does it feed on?
  - What does a bird do (various activities) after it arrives on a plant?
  - For how long does it stay in a particular place and what does it do there?
  - Which plants and objects does the bird use?
  - Does it have its nest on a nearby plant? If yes, on which plant?
- Give 45 minutes to make observations on all these points and ask them to write their observations in their notebooks.
- Then, gather all the students together and review their observations. Engage them in a discussion about their observations - what did they observe? What was the bird eating and doing? etc. Also, discuss with them the adverse effects if the tree cover is not maintained in the surroundings.

Objectives:

- To help the students understand the relation between the plants and the birds in the surroundings
- To help improve their observation skills and develop a deep connection with the elements in nature

5 Indicator Species

Indoor

Unit

Ecosystem

Activity Duration

1 hour

Activity Month

July

Method

Discussion

Material

Notebook, pen

Instructions for Teachers

Read the additional information about indicator species given with this activity.

Activity

- Take a recap of the field visits to various places conducted till now.
- Ask the students which birds/animals/trees they have sighted and ask leading questions such as, which bird(s) were sighted in large numbers near the garbage dump? Did they see any insects in large numbers in the small water pools near the school / river?
- Generally, the students' answers would include crows, kites, mosquitoes, dogs, etc. Write these answers on one side of the blackboard.
- If the students have not made such observations, tell them about these observations and that such animals/plants are sighted in the smaller villages on the periphery of the cities, where there is a lot of garbage, and the river/pond is polluted.
- If an animal/insect/bird is observed in large numbers in a particular place, it helps us make inferences about the condition of the place. If there are a lot of mosquitoes near the water, then one can conclude that the water is dirty. If a large quantity of sewage water is being released into a river, then water hyacinth can be seen in the water.
- Like these indicators of a degraded ecosystem, there are also the indicators of a healthy ecosystem.
- Now ask the students which animals/plants have they sighted in the clean water spring/lake/river in the village/town/city/ neighbourhood?
- The answers would include lotus, fish, frog, reeds, etc. Help them if they cannot answer and write these answers on the blackboard too.
- Based on this, give some more examples of animals/birds/ plants that are **'the indicators of a degraded ecosystem'** and **'the indicators of a healthy ecosystem.'**
- Ask the students to note down the points of the discussion and the information on the blackboard in their notebooks.

Objectives:

To help the students understand that the animals/birds/trees indicate the condition of the ecosystem, and they also indicate the changes in the ecosystem

Additional Information for the Teachers

Indicator species

Each plant and animal has a specific role in the nature. Some specific plants and animals are found in particular ecosystems only. When an ecosystem undergoes biological changes that improve or deteriorate its condition, different plants and animals compared to the earlier condition are found there in particular. A hypothesis can be built based on these observations and the number of such plants or animals. These species are called **'Indicator species.'** For example, if a river is very polluted, water hyacinth grows in it in large quantities, a lot of mosquitoes are produced in water clogged pools, etc.

Indicators of degradation of the ecosystem

- **Crow -**
  Sighted in large numbers near garbage.
- **Kite -**
  Sighted in large numbers near garbage.
- **Mosquitoes -**
  Grow in abundance in polluted water.
- **Water hyacinth -**
  Grows in abundance in polluted water.
- **Rats / mice -**
  Sighted in large numbers near garbage.
- **Black winged stilt -**
  Sighted in abundance in polluted water. They get to eat a lot of insects and worms in such water.

Indicators of a healthy ecosystem

- **Dragonflies -**
  Sighted in abundance near clean water. They eat tadpoles, insects and worms in the water.
- **Riverside reed/Nut grass -**
  Found in clean water.
- **Lotus -**
  Grows in clean water.
- **Pied kingfisher -**
  Sighted near clean water and feeds on fish in the water.
- **Pheasant-tailed Jacana -**
  Sighted in clean water.
- **Frogs -**
  Found in large numbers in clean water.
- **Indian Giant Squirrel -**
  State animal of Maharashtra, sighted in dense forests.
- **Indian Paradise Flycatcher -**
  Sighted in areas with vegetation.
- **Great Indian Bustard -**
  Sighted in healthy grasslands.

6 Forest Ecosystem: An Introduction

Outdoor

Unit

Ecosystem

Activity Duration

2 hours

Activity Month

July

Method

Field visit, discussion

Material

Notebook, pen, binoculars (if available), measuring tape (tailor tape)

Instructions for Teachers

- Identify a jungle/natural forest near the school and ideally give preference to a sacred grove or a forest under the Forest Department. Obtain required permissions to visit the forest.
- Before taking the students to the forest, it is important that the teacher is able to identify the main trees and bushes found there. Therefore, the teacher should get acquainted with their names from the local residents. If possible, ask the botanists, or local guides to accompany on the field visit.
- Carry the map prepared in the map reading activity from Book 1.
- If there is no forest in the town/village, then omit this activity or show the students a documentary on the forests.
- Refer to the website link provided for additional information.

Activity

- Read the special instructions for the field visit given in the book and ask the students to prepare accordingly.
- Before leaving for the field visit, ask the students to locate the forest on the map of the village/town/city prepared in the 'Map Reading' activity from Book 1. Alternatively, draw a quick schematic map of the region and orient them to the location of the forest. Ask them to find the direction in which it is situated. If the forest was not marked in the map reading activity, show and mark the location of the forest on the map.
- Then, take the students to the forest, divide them in groups of 4 to 5 students each and ask them to sit in an appropriate place. Ask the students to quietly listen to the calls of various birds and watch the birds for 10 minutes.
- Revise the activity 'Native and Non-native Trees.' Ask them which trees they see around them.
- Normally, the students would name the following types of trees:
  - Large trees
  - Bushes
  - Creepers
  - Shrubs
  - Grass
- Explain to the students that a forest containing all the above types of plants may most likely be a natural forest. However, if the same type of trees are seen at a specific distance from each other and of the same height, then it can be a plantation. Mostly, the trees planted are non-native.
- After explaining the difference between a forest and a plantation, ask the students to write it in their notebooks.
- Ask the groups of the students to go to a few selected places in the forest and note their observations about everything including trees, birds, animals, insects etc.
- Ask the students if they can identify a food chain from the observations made and to write it down in the notebook.
- Ask them whether any garbage is seen around, and to note down what garbage it is.
- Thereafter, tell them the names of the main trees and ask the students to measure the circumference of the largest tree (trunk) in the forest. Discuss the importance of such large trees with the students. It provides shelter to many animals and birds for many years, regulates the temperature of the surrounding area, provides shade, etc.
- To conclude, engage the students in a discussion that the forest is an ecosystem, as the non-living things like water, soil and the living things like trees, animals are dependent upon each other. Add some other characteristics of the ecosystems too. For example, the food chain, food pyramid prepared last year, etc.

Objectives:

- To introduce the students to the natural ecosystem in the surroundings
- To help the students understand the components of the forest ecosystem and their importance

Important note: At the end of this activity, remind the students to note the observations of the Sun-dial.

7 Mountain Ecosystem: An Introduction

Outdoor

Unit

Ecosystem

Activity Duration

2 hours

Activity Month

July

Method

Field visit, discussion

Material

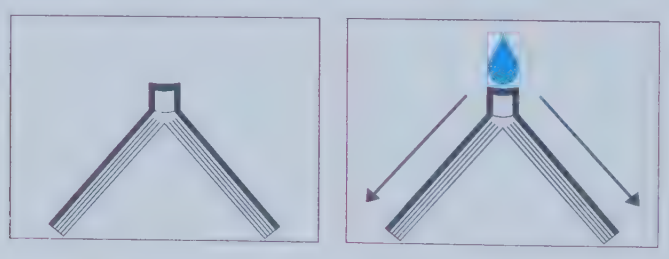
Notebook, pen, binoculars (if available)

Instructions for Teachers

- Identify a hill/mountain near the school and obtain permissions required, if any, to visit the location.
- Carry the map prepared in the map reading activity from Book 1 with you.
- Not every village/town/city would have a hill/mountain, so if there is no hill/mountain in your village/town, omit this activity.
- Refer to the website link provided for additional information.

Activity

- Read the special instructions for the field visit and ask the students to prepare accordingly.
- Before leaving for the field visit, ask the students to identify the hill/mountain in the map of the village/town/city prepared during the map reading activity from Book 1 and ask them in which direction it is situated.
- Then after taking the students to the hill/mountain, divide them into groups of 4-5 students each and ask them to sit facing the hill/mountain.
- Ask the students to name what all elements/components can they see on the hill/mountain?
- How is the hill/mountain slope? Is it gentle or steep? What kind of vegetation is there on the slopes - trees, bushes, grasses?
- Ask them to observe the rocks/soil and the different layers of the soil.
- Ask the students to identify the direction to which they are facing. Explain to them how they can identify the directions when they are outdoors.
- Send each group to the various spots on the hill/mountain and ask them to note their observations as discussed above.
- Along with the plants, ask the students to observe animals, birds, insects etc. and write their observations in the notebook.
- Allocate 20-25 minutes for these observations to each group.
- Ask the students if they can identify a food chain in the observations made and to write it in the notebook.
- After observing these components, ask the students the importance of the hill/mountain ecosystem? After the students have answered, ask them what happens when it rains on the hill/mountain?
- If the students are unable to imagine this, take a notebook and place it inverted in the form of a triangle and then ask the same question.



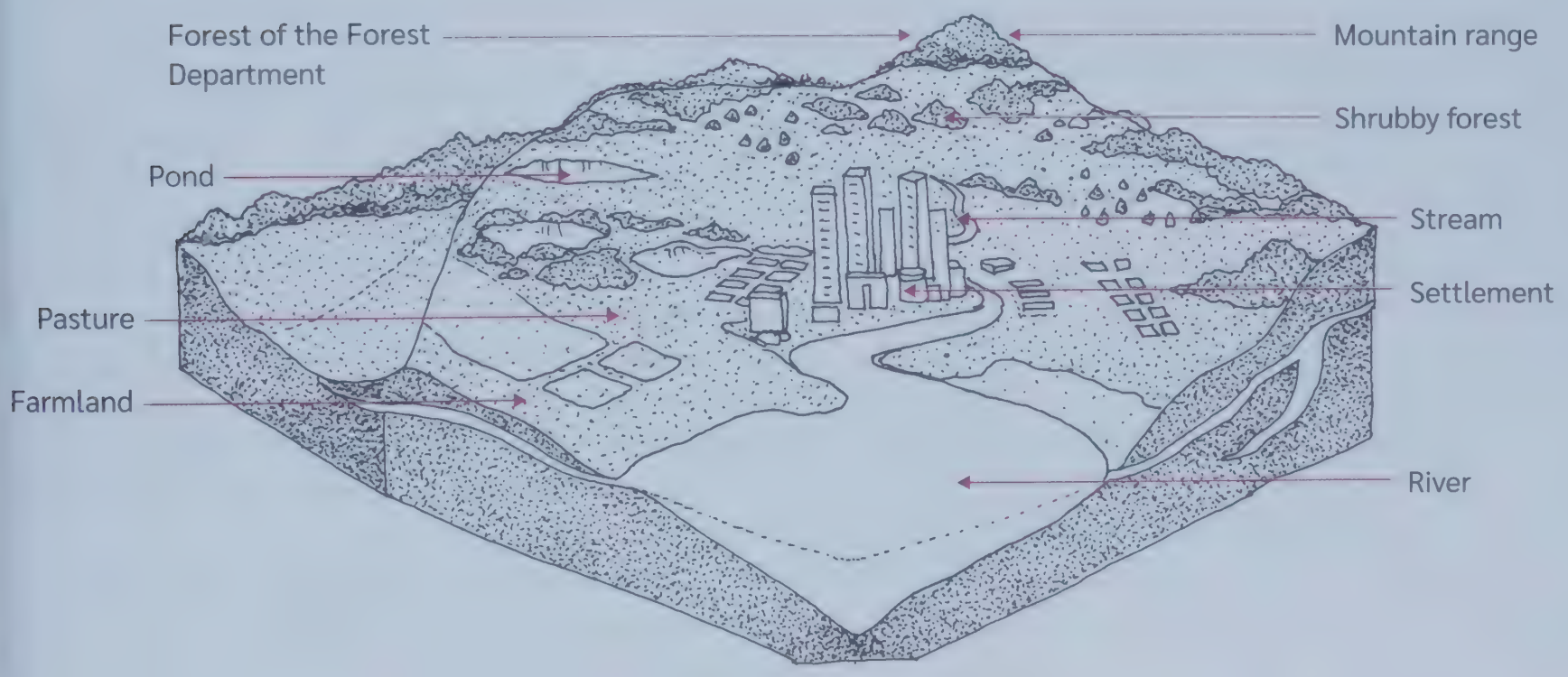
- After the students try to answer, tell them that when it rains on the hill/mountain, the rainwater flows down from both the slopes of the hill/mountain. **Hence such a hill/mountain is called a water divide.**

Objectives:

- To introduce the students to the natural ecosystem in their region
- To help the students understand the components of a mountain/hill ecosystem and their importance

- The water that flows down from the hill/mountain eventually meets a stream. The area on which this water flows and joins the stream, is called the **catchment area.**
- Then, ask the students where the catchment area of the hill/mountain, on which they are sitting, lies. If they cannot answer, explain it to them.
- Now take the students to a gentle slope and stand at the foot of the slope.
- Ask the students, "how is this slope?" On this, the students would probably answer that the slope is somewhat steep, somewhat less steep, straight, etc. Determine the slope of the hill/mountain through such a discussion.
- Ask the students to identify the various small streams in the catchment area seen in front of them. Tell them that since the streams originate on the hill /mountain they are an 'important source of water'. Engage them in a discussion about which streams flow round the year or which streams have the 'spring water' in them. Highlight the importance of such a spring for the humans and animals and birds.
- Ask them where they can see the human elements (buildings, mining, farming) in the landscape in front of them. Also discuss whether they can see any positive or negative effects (the advantages and disadvantages for humans and nature).
- To conclude, engage the students in a discussion that the mountain/ hill is an ecosystem, as the non-living things like water, soil and the living things like trees, animals are dependent upon each other. Add some other characteristics of the ecosystems too. For example, the food chain, food pyramid prepared last year, etc.

Catchment area



(This is an imaginary picture. The components shown in this picture are only for illustrative purposes. If you see any different elements than these, please show them to the students).

8 Types of Forests

Indoor

Unit

Ecosystem

Activity Duration

1 hour

Activity Month

July

Method

Discussion, map reading

Material

Map of your state, notebook, pen

Instructions for Teachers

- Read about the forests in your region and refer to the website link provided for additional information.
- Identify the examples of each forest type. For example, where can we find evergreen forests or deciduous forests in Maharashtra? Or Mangroves in Tamil Nadu or scrub forest in Rajasthan.
- The types of forests mentioned in this activity are the major types. They are further classified in sub-types, which are not covered at this level.

Activity

- Ask the students to name the various trees seen in their surroundings. Out of these trees, ask them to identify the ones that shed their leaves and make a list of the names given by the students on the blackboard. Next, ask them which trees remain leafy and green throughout the year, and never shed their leaves and make another list on the blackboard. Thereafter, ask them if they have seen any thorny bushes or the mangroves and to name the location of such trees.
- Once the lists are complete, write appropriate titles on the top. For example, deciduous, evergreen, thorny forests, etc. Also, inform the students that these are the types of the trees as well as the types of the forests.
- After writing the names, ask the students whether they understand the meanings of these names and if not, explain the meanings to them.
- Thereafter, place the map of your state in front of the students and ask them which type of forest can be found in the various regions and why.
- Once the students answer, explain the following points:
  - **Evergreen and semi-evergreen forest:** These forests are found in the regions with heavy rainfall and the trees in these forests have leaves throughout the year, e.g. – Mango, Jackfruit.
  - **Deciduous forest:** In regions with dry summers and less rainfall, forests have trees which shed their leaves in winter, such a forest is a dry deciduous forest. Trees like Cotton Silk Tree, Flame of the forest, Indian Coral tree, Indian Ash tree etc. can be found here.
  - **Moist deciduous forest:** These forests are found in regions with moderate rainfall and have mixed types of trees such as some semi-evergreen trees, some borderline deciduous trees (trees which shed leaves only partially and not fully) and some deciduous trees. Trees like Indian Laurel, Kindal tree, Cluster Fig etc. can be found here.
  - **Thorn or scrub forest:** These forests can be found in the regions which receive very scarce rainfall and have thorny plants-bushes. For example – Babool, White Babool, Acacia Catechu trees can be found here. These forests also have abundant grass.

Objectives:

To introduce different types of forests to the students

- **Montane forest**: Montane means mountainous regions. The Himalayan region in the North and North-east of the country and some locations in the Southern Western ghats, such as Nilgiri mountains have montane forests. Himalayan regions have broadly two types of forests, **Coniferous forests** at higher altitudes and **Broad- leaved forests** at Himalayan foothills. Coniferous forests have trees like Deodar, Pine, Fir, while Broad leaved forests have conifers as well as Oaks, Rhododendrons. Some high-altitude regions in the Himalayas also have alpine grasslands or meadows. The Southern Western ghats have ever green forests with grasslands (example Shola grasslands) interspersed with these forests.
- **Littoral and swamp forest:** Littoral and Swamp areas are nothing but wetlands, where water is accumulated through the year. For example, near lakes, where rivers drain into the seas forming deltas etc. Mangrove forests are found in many of the delta regions on the Eastern and Western coast of India.

▶ After giving this information to the students, ask them to show on the map which forests can be found in which region and engage them in a discussion about the same.

▶ Take help from the table below and tell the students how rainfall impacts forest types and how one can co-relate the rocks, soil, rainfall, temperature/climate, forest types, and biodiversity in these forests in India. Take examples from your region/state.

Rainfall (inches)	Type of Forests
80" or more	Evergreen or semi-evergreen
80" to 40"	Moist deciduous
40" to 20"	Dry deciduous
Less than 20"	Dry deciduous shrubby forest thorny forest, grassland, desert
Other important types of forests	Coniferous forest, Mangrove Forest

9 Forest in the Surroundings

Indoor

Unit

Ecosystem

Activity Duration

1 hour

Activity Month

July

Method

Writing

Material

Notebook, pen

Activity

- Ask the students to describe the forests seen in the local region, based on their observations and notes from the previous field visit to the hill/mountain or the forest, and based on the types of forests that they have learnt.
- As a part of the activity, the students are expected to write the types of trees that are seen around the school and their house and classify them as evergreen or deciduous, coniferous trees etc. The students can discuss and take help from the teacher where needed.
- Ask the students to answer the following questions to help them detail their description:
  - Are there forests or plantations in the region?
  - If it is a forest, then which type of forest is it? Is it one particular type of forest or is it a mix of 2 or 3 types of forests?
  - If it is a plantation, then which trees have been planted and why? etc.
- If there is no forest, then ask the students to think whether one existed in earlier times. Are there any signs or indicators of an old forest in the region? Hold a preliminary discussion on why the forest must have reduced or disappeared.
- Check the notebooks after the students finish writing the description and ask a couple of students to read out their description to the class.

Objectives:

To verify whether the students have understood the types of forests and whether they can describe a forest in the surroundings

10 Autobiography of a Wild Animal

Indoor

Unit

Animals

Activity Duration

1 hour

Activity Month

July

Method

Writing

Material

Notebook, pen

Activity

- Ask the students to write an autobiography of any wild animal that is found in the forests around the village/ town/ city or from the stories/discussions from previous field visits. Tell them not to include any domestic animal.
- If the students do not know what an 'autobiography' is, explain it to them. For example, a student writing a story, imagining he is a 'tiger' or a 'hare'.
- After completing the task, ask one or two students to read out their stories. Display all the stories on the display board of the class for a few days and ask everyone to read them.
- Encourage the willing students to draw sketches along with writing the autobiography.

Objectives:

- To inculcate a deep sense of connection towards wild animals in the students
- To see how the students are able to apply the acquired knowledge

Important note: At the end of this activity, remind the students to note the observations of the Sun-dial.

11 India: Bio-geographic Regions

Indoor

Unit

Climate - Weather

Activity Duration

2 hours

Activity Month

August

Method

Discussion, writing, observation

Material

Maps of India (geographical/physical and political), pen/pencil, notebook, photocopy of the map of bio-geographical regions of India

Instructions for Teachers

- Study the different geographical zones of India and gather information about the regions that are a part of a particular geographical zone.
- If possible, show the photographs (landforms, geological features, vegetation), or videos of all the bio-geographical regions to the students.
- For additional information, refer to the website link provided.
- Photocopy the map of the bio-geographical regions of India given on the next page.

Activity

- Keep the photocopy of the bio-geographical map of India in front of the students and ask them to read the various regions (according to the legend) shown on the map. If such a map is not available, request the drawing teacher to draw the map given below on a large cardboard.
- Divide the class into groups of 4-5 students each.
- Place the map on the floor and ask the students to sit around it in groups.
- Ask the students what the legend on the map indicates and ask one student to read it.
- Then place the political map next to the geographical map and ask the students which states fall in which region and ask them to write it in their notebooks. Also, ask the students to try and name the characteristics (climate, type of trees etc.) of a geographical region pertaining to the states in that region.
- For example, **Desert** - state of Rajasthan lies in this region, then the climate of Rajasthan will have very high temperature and therefore thorny bushes, sand; **Himalayas** - mountainous and snowy region, coniferous trees; and so on. Help the students if they are unable to describe a particular region.
- Ask the students to write all this information in their notebooks in the table format as given below.

Bio-geographical region	Characteristics	States

Objectives:

To help the students understand about all the bio-geographic regions in India

Bio-geographical Regions in India

The states of Sikkim and Arunachal Pradesh are also considered among the North-Eastern regions.

* Percentage with reference to the total area of India

(Map credit: Wildlife Institute of India)

Additional Information for the Teachers

Bio-geographical region	Characteristics of the region	Fauna
Trans-Himalaya (Sub-Himalaya)	The region beyond the Himalayas. Sparse vegetation. Extremely cold and unstable climate.	Snow Leopard, Himalayan Brown Bear, Wild Sheep, Wild Goat, Marmot, Apollo Butterfly, Birds like Grandala, Black Necked Crane.
Himalayas	The highest mountain range of India, steep slopes, unstable region leading to constant landslides. Earthquake - prone region. Temperate climate and characteristic coniferous vegetation.	Snow Leopard, Himalayan Brown Bear, Wild Sheep, Wild Goat, Ibex, Shrew, Red Panda, Himalayan Tahr. Beautiful birds, like Himalayan Monal, Tragopan, Himalayan Vulture.
Desert	Extreme climate. Very hot summer and cold winter. Very less precipitation. Desert with thorny vegetation - cactus like plants (Cactaceae). (The Thar desert in Rajasthan and the Kutch desert in Gujarat)	Camel, Wild Ass, Desert Fox, Indian Gazelle, Caracal. Spiny-Tailed Lizard, various types of snakes. Various types of birds.
Semi-arid	The region which is a transition between the desert and the forest with an extreme climate, thorny bushy forest, dominated by grasses.	Tiger, Leopard, Foxes, Wolves, Nilgai, Black Buck, Snakes. Birds, like the Great Indian Bustard, Vulture.
Western Ghats	The mountain range parallel to the western coastline. Region with heavy precipitation. Abundance of habitats due to the varied geographical structure and hence very characteristic and uncommon biodiversity. An important biodiversity hotspot in the world. Evergreen forests.	Tiger, Leopard, Sambar, Indian Giant Squirrel, Wild Dog, Bison, Elephant, Muntjac, Sloth Bear, Wild Pig, Lion-tailed Macaque, Nilgiri Tahr, Slender Loris. Endemic amphibians like Caecilian, Malabar Frog, Koyna Toad. Birds like Great Hornbill and Malabar Hornbill; Schimitar Babbler, Malabar Whistling Thrush. Snakes like King Cobra, Python. Butterflies, like Malabar Tree Nymph, Southern Birdwing.

Bio-geographical region	Characteristics of the region	Fauna
Deccan Plateau	A large region in Central India with low precipitation. Dry deciduous and thorny bush forest. Large forests of Teak and Sal trees. This region includes the Satpuda mountain range and the Eastern Ghats.	Animals, like Tiger, Leopard, Wild Dog, Spotted Deer, Muntjac, Ratel, Sloth Bear, Elephant, Wild Pig, Indian Gazelle, Black Buck, Nilgai. Birds like Spotted Owl, Vulture, Great Indian Bustard. Various species of snakes.
Ganges basin / Ganges delta	The region formed due to the alluvial deposits by the river Ganga, right from its source (the Himalayas). Fertile land for agriculture due to the alluvial deposit. Deciduous type of forest.	Tiger, Leopard, Elephant, Sloth Bear, Muntjac, Gangetic Dolphin, Swamp Deer, Ghariyal, Saras Crane.
Coastal areas	Approximately 5,500 km long coastline. A region rich in sandy, rocky shores, sand dunes, mangrove forests, rivers flowing into sea/ocean forming deltas and bays.	Various species of fish, Starfish, Crocodile, Sea Turtle, Conch, Sea Shells, Moss, Corals, Oyster, Sea Snake, Octopus. Sea birds like Black-Capped Kingfisher, Gull, Petrel.
North-Eastern region	Moist evergreen rain forests. Forests and bio-diversity in excellent condition. Variety of Orchids, Bamboos and Ferns. Bio-diversity linked to the Indo - Malayan Peninsula, basin of the Brahmaputra and ranges of Eastern Himalayas, diverse tribal region.	Tiger, Leopard, Clouded Leopard, Rhino, Elephant, Wild Buffalo, Monkeys like Golden Langur and Capped Langur, Yellow Throated Marten, Red Panda. Colourful and rare birds like Scarlet Finch, Bugun Liocichla. Colourful butterflies like Bhutan Glory, Bamboo Forester, Sergeant Major, Popinjay, Commodore.
Islands	The original evergreen forests can be seen on the Lakshadweep and Andaman -Nicobar islands. There are many endemic (those found only in that region) species of plants and animals.	Coral Reefs are famous. Characteristic birds like Narcondam Hornbill, a species of swifts called Edible - nest Swiftlet, Nicobar Megapode, Andaman Scops Owl. Sanctuary for ocean migratory birds.

- The chart above gives some main and notable examples of the important characteristics and the fauna of the bio-geographical regions. These regions actually have a lot more bio-diversity.
- This chart is provided as an additional information for the teachers. Use this information during the activity and the discussion, but do not read this information to the students.

12 Marine Ecosystem: Part 1

Unit

Ecosystem

Activity Duration

2 hours

Activity Month

August

Method

Field visit, discussion

Material

Notebook, pen, pencil, binoculars (if available), measuring tape

Instructions for Teachers

- If the school is located near a sea, take the students there for this activity. Visit the seashore before the field visit so that you get a good idea of the marine ecosystem.
- Interact with the local people to find out the names of the plants/birds/ invertebrate animals found on the seashore.
- Study the marine ecosystem and the bio-diversity associated with it by reading the additional information given below.
- Read the additional information on the website link provided and take printouts of the images of the marine bio-diversity before the activity.
- Skip this activity if the school is not located in the coastal regions of India. You can introduce the marine ecosystem to the students using the pictures and conduct a discussion.
- Reference books:
  - Seashore life of India, B. F. Chhapgar

Activity

- Take the students to the seashore.
- If possible, show them both types of shores - rocky and sandy beaches.
- On reaching the seashore, first make the students sit together and ask them to write what they can see around them.
- They would normally write elements like the sand, rocks, waves, sea, trees, birds, etc.
- Ask the students the names of the trees found on the seashore and their importance (most beaches may have Coconut Palms, Kewda or Fragrant Screw Pine and Whistling Pines, etc).
- Tell them that these trees act as a barrier against the incoming waves and the wind. There are also some creepers on the sea shore which hold on to the sand on the shore and prevent soil erosion. If such creepers are seen on the beach during the visit, show them to the students.
- Show them the pictures of some of the animals and plants found near the sea with information. For example - Barnacle, Sea Cucumber, Sea Shells, Conch, Fish, Crab.
- Now, divide the class into groups of 4-5 students each. Some groups can walk parallel to the sea water and some groups can walk parallel to the tree line. They have to walk for 1km and observe and note/describe the plants and animal diversity within 5meters on both the sides.
- Mark the start and the end point with different symbols.
- Instruct them to note all the plants and animals including birds, insects, aquatic animals, etc.
- Ask the students whether a food chain can be formed from all the names that they have listed. If so, write it in the notebook.

Objectives:

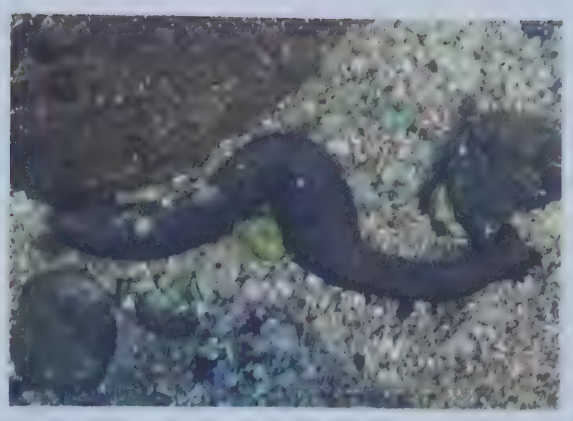
To introduce the Marine ecosystem to the students

Additional Information for the Teachers

- If such notes can be taken every month, then this activity can be carried out for the whole year.
- Give information to the students while showing the photographs of the animals such as Barnacles, Sea Urchins, Sea Cucumbers, Shells, Crabs:
  - **Barnacles:** Found in the salt water. Seen in the shallow waters and on the rocks. Their shell is made up of calcium and they are categorised as 'Arthropoda'.

  - **Sea Urchins:** They belong to the category of 'Echinoderms'. They swim very slowly and feed on the moss and are found in the shallow and deep seas.

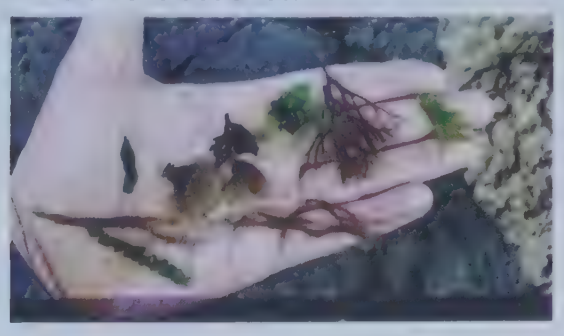
  - **Sea Cucumbers:** These animals belong to the category of 'Echinoderms'. They have long bodies and are found at the bottom of the sea. However, sometimes they can be carried by the waves to the seashores.



  - **Starfish:** The animal that resembles a star. Its body becomes brittle on drying.

  - **Oysters:** Oysters stick together to protect themselves from waves and predators. They protect coastlines and also arrest erosion.

  - **Algae:** Various types of algae commonly known as green algae, red algae, brown algae can be found on the beaches.



  - Many other shells, bivalves and other creatures not mentioned here can be seen on beaches.

13 Mangrove Forest

Outdoor

Unit

Ecosystem

Activity Duration

2 hours

Activity Month

August

Method

Field visit,

Material

Notebook, pen, binoculars (if available),

Instructions for Teachers

- If there is a mangrove forest near the school, take the students for a field visit.
- Check the routes in the forest beforehand and enquire if some of the routes require traveling by boat.
- Refer to the website link provided for additional information on the mangrove forests.
- Get acquainted with the names and the uses of various mangrove trees.
- If there are books about the mangrove forests in the school library, bring them to the class.

Activity

- Give a brief introduction about the mangrove forests to the students before the field trip.
- Ask the students where mangrove forests can be found in India. As they answer, draw the map of India on the blackboard as shown below and mark the locations of mangrove forests on it.
- Then take the students to the location of the field visit. Ask them to observe and make a list of all the components that they can see in the mangrove forest.
- They should categorise the components as living and non-living things.
- After observing the components, ask the students to focus on the peculiar type of vegetation. Ask them to observe the roots of the trees and give the following information. The roots of the mangrove trees resurface above the muddy soil and so are known as the **aerial** roots. Since the muddy soil near the sea has a high content of salts, the roots do not get enough oxygen, and hence they resurface above the soil in search of oxygen.
- Also tell them that the new sapling grows on the tree itself.
- Ask the students to observe other aspects of the trees -leaves, flowers, fruits etc. Give more information about the mangroves including the names of the plants.
- Thereafter, ask the students why the mangrove forests are important and if they cannot answer, give them the following information:
  - The mangrove forests function as a **barrier** in case of events like the Tsunamis. The waves break off on this barrier and their intensity and speed is reduced as they hit the land.
  - Similarly, the mangroves are a **habitat for various endemic species** of animals and birds. Show the actual diversity on the site to the students. For example, various crabs, frogs, birds, Mud-Skippers, etc.
  - Various species of fish breed in and around the mangroves.
  - Mangrove forest is home to the special species of animals and birds, like the Black-Capped Kingfisher.
- Ask the students to check whether a food chain can be formed from the various components observed.
- Lead a discussion to contemplate what would happen if any one of these elements were to disappear. If they are unable to answer, explain.

Objectives:

To introduce the students to the mangrove forests

Black-Capped Kingfisher

Mangrove Forests in India

Important note: Read 'Preparation for the Activity' from the next session and instruct the students to gather data accordingly.

14 Wild Vegetables

Indoor

Unit

Plants

Activity Duration

1 hour

Activity Month

August

Method

Interview, discussion

Material

Notebook, pen, pencil

Preparatory Activity

- 2-3 days prior to the activity, divide the class into groups of 5-6 students each. Ask these groups to talk to the people or elders in the village/town/city and collect information about 'wild vegetables'. They can collect the information by asking the following questions:
  - What are wild vegetables?
  - Name some of the wild vegetables.
  - In which months do they grow?
  - What are the health benefits of eating these seasonal vegetables?
  - Which wild vegetables used to be available in earlier times?
  - Which ones are available now? etc.
- Ask them to visit the local vegetable market and see which wild vegetables are available.

Instructions for Teachers

Study the information given on the website link provided for additional information. Make a list of wild vegetable available locally and get more information about them.

Activity

- Ask the students about the information that they have collected about the wild vegetables through leading questions.
  - What are wild vegetables?
  - In which month these vegetables are available in the market? Which wild vegetables have they seen / eaten?
- Then ask each group to read their information about the wild vegetables one by one and write it on the blackboard in the chart as follows:

Name of the wild vegetable	Month of availability	Information (use, characteristics)	Have they eaten it?

- While filling the chart, the teacher can add the wild vegetables found out by him/her to the chart. Discuss with the students if they have seen or eaten any of the wild greens listed. Tell them the importance of the wild vegetables/greens (nutritional value and medicinal properties).
- After the discussion, ask the students to copy this chart in their notebooks.

Objectives:

To introduce the students to the various wild vegetables / greens

Important notice: At the end of this activity, remind the students to note the observations of the Sundial.

15 Trees and Interdependence

Outdoor

Unit

Plants

Activity Duration

2 hours

Activity Month

September

Method

Field visit, discussion

Material

Notebook, pen, pencil, binoculars (if available), photos of orchids and epiphytes (if available)

Instructions for Teachers

- Choose 10 different trees in the school premises and note their names.
- Conduct this activity either between 7 to 10 am in the morning or between 4 to 6 pm in the afternoon.
- If orchids, epiphytes and parasitic plants are not very common in your region, show the images of these plants to the students for this activity. You can also take printouts of the images shared for this activity at the website link provided for additional information.

Activity

- Divide the class into groups of 4-5 students each.
- Take them to the school ground where 10 trees have been identified and ask each group to observe any 2 trees. Instruct them to maintain silence while observing the trees.
- While noting the observations, ask one group member to observe if there are any other plants growing on the tree. Also observe birds and insects attracted to the flowers and fruits on the tree, nests of birds/insects/ants if any. The groups should make notes in detail in the notebooks.
- Allocate 10-15 minutes for observation. Guide them if required.
- After the observations are complete, come back to the classroom and ask the students to read their observations. After listening to the observations of all the groups, write the important points on the blackboard. For example, bird's nest, bird eating fruits from the tree, an epiphyte growing on the tree, ants on the tree etc.
- Now, engage the students in a discussion about the **interdependence** between the tree and the birds, insects, animals, for e.g. -
  - The birds eat the fruits of a Banyan tree or a Peepal tree and the seeds are thrown out through their excreta. This helps in dispersing the seeds over a large distance and facilitates the process of the seed germination.
  - The butterflies/insects suck nectar from the flowers and in return, the flowers are pollinated through the pollens carried by the insects which helps the plants to produce fruits.
- In this way, **the tree and the animals and birds benefit from each other. This type of cohabitation is called symbiosis.**
- Ask the students whether they have seen 'orchids' that droop down from the trees. Some students may answer as 'Yes'. Orchids may not be found in all the parts of India, so refer to the images to get introduced to this type of floral diversity.
- Ask the students if such flowering plants growing on the bark of a large tree harm the tree in any way? What do these flowers get from the tree? Through such leading questions, tell them that these particular type of flowering plants grow on the tree trunk which is their habitat, but such plants do not harm the tree, nor do they affect the growth of the tree.
- Thereafter, ask the students whether anyone has seen parasitic plants growing on a tree. If possible, show them a photo of a parasitic plant. Once again, ask them leading questions, like- does the growth of a parasitic plant harm the tree? Then tell them that the parasitic plants like Cuscuta grow by absorbing the food/sap from the tree, which harms the tree. At times the tree may even die due to the growth of parasitic plants on it.
- Write the main points of this discussion on the blackboard and ask the students to copy them into their notebooks.

Objectives:

To help the students understand the interdependence between the trees and other plants and animals

16 World of the Animals on an Old Growth Tree

Outdoor

Unit

Plants

Activity Duration

2 hours

Activity Month

September

Method

Field visit

Material

Notebook, pen, pencil, binoculars (if available)

Instructions for Teachers

- Refer to the website link provided for additional information on **'Keystone species - Old Growth Trees'**.
- A variety of birds and animals depend on large and old trees like **Banyan, Peepal, Cluster Fig, Sacred Fig, Indian Laurel Tree or Deodar tree** in the Himalayas for various purposes such as nesting, feeding on the leaves, fruits and insects, roosting etc. **Such trees which provide habitat to a large diversity of birds and animals, are called the Old Growth Trees.**
- Identify such large old trees in the school premises or in the neighbourhood of the village/town/city. Try to find a tree that matches the above description.
- Also try to find the commonly sighted birds, insects and animals in the surrounding areas and introduce the students to them during the activity.

Objectives:

- To help the students understand ecological importance of the 'Old Growth Trees'
- To help the students realise that they should conserve and protect such 'Old Growth Trees' in the village/ town/city from felling

- Schedule the activity between 7 to 9 in the morning or 4 to 6 in the evening, as it's a good time to spot different birds. If not, choose a time in the afternoon.

Activity

- Divide the class into groups of 4-5 students each.
- Allocate 1 Old Growth tree to one group.
- Instruct the students to sit near/infront of the tree, and observe it without talking among themselves, and note their observations in the chart given below.
- Ask them to observe birds, butterflies, insects, animals (squirrels, snakes etc.) visiting the tree and to carefully note how they use various parts of the tree.
- Allocate about half an hour to note down their observations.
- Then return to the classroom and ask all the groups to present their observations to the class.
- Collate all the observations about each species of old growth trees together.

- Make the students aware of the use of the same tree by the various animals and birds. Engage them in a discussion about what would happen if such a tree is destroyed and explain the importance of the **Old Growth Tree** to them.
- Ask the students whether they have seen such a tree anywhere else and ask them to enquire with their parents too.
- Based on this activity, another activity of sketching of such a tree can also be conducted.

Sample chart

Name of the Old Growth Tree	
Time of observation	..... AM/PM to ..... AM/PM
Animals like various insects and birds visiting the tree (if they do not know the names of all the animals, ask them to write bird 1, bird 2, etc. for various species of the birds)	How they use the tree - For example – Bulbul eats the fruit. Parakeet builds a nest in the tree trunk. Coppersmith Barbet - eats ants, big ants, small fruit.

Important notice: At the end of this activity, remind the students to note the observations of the Sun-dial.

17 Cattle and Plants

Unit

Animals

Activity Duration

2 hours

Activity Month

September

Method

Observation, trips

Material

Notebook, pen

Instructions for Teachers

- Before the activity, ask some of the villagers or milkmen in the neighbourhood for the number of houses in the village/town/city that have cattle (cows, buffalos, goats, etc.) and the time when the cattle is taken for grazing.
- Visit 4-5 such homes and enquire if they are willing to take 8-10 students and 1 teacher with them when they take their cattle for grazing. Invite 3-4 teachers from the school to participate in this activity.
- Tell the milkmen that this activity is a part of the school studies, and the objective is to help the students get information about plants eaten by the cattle and those that are not eaten by them.
- It might be difficult to find Gaushalas in the cities these days, so alternatively, schools in a city can visit a "Gaushala" nearest to them/or at the periphery of the city for this activity.

Activity

- Begin the activity by asking the students about the uses of the cattle. Discuss about their place in the society, their uses for farming, milk, food, etc.
- Ask the students if they have seen the cattle feeding on different plants and can they name the plants/leaves/grasses. It might be difficult for the students in the cities to relate to this. So ask them if they have visited their ancestral villages and noticed these things, or relate your experiences to them. Make a note of the names of the plants.
- Divide the class into groups of 10 students each. As decided with the milkmen or Gaushala authority, send one group and a teacher with each cattle herder. This activity should take about 40-45 minutes in a village or town but more in the city.

Name of the cattle	Name of the plant	Number of native plants	Number of non -native plants
Goat	Indian jujube, Mango, Mahua, etc.	3	0
Cow	Indian jujube, Acacia, Wild tamarind	2	1

- Instruct the students to note which plants the cattle feed on, in their notebooks in the form of a chart as given above.
- Tell the students that if they do not know the names of the plants, they should ask the herder or the teacher.
- Ask the students to get the information about the plants that the cattle do not feed on at all, their names and reasons. Eg: *Calotropis procera* for milky latex, *Vitex negundo* for pungent smelling leaves, etc.
- Also ask the herder about the plants/grasses that the cattle eat the most.
- Ask the students to note these observations in the notebook.

Objectives:

- To help the students understand food (plants) liked by cattle, natives or non-natives
- To help the students find out which plants should be cultivated for feeding cattle

18 Threats to Wild Animals

Indoor

Unit

Animals

Activity Duration

1 hour

Activity Month

October

Method

Discussion

Material

Notebook, pen

Instructions for Teachers

- Refer to the website link provided for additional information.

Activity

- Ask the students about the problems that they experience in their everyday life. The probable answers may include lack of water, pollution of the water in the river/stream, lack of fish in the river/stream, garbage piles, problems on the farm, students living in a city may encounter problems like garbage mounds, traffic, no playgrounds or gardens to play, noise pollution, etc.
- After discussing the problems of the humans, ask the students about the possible threats and problems that the wild animals would be facing. Ask them to consider all the types of animals – mammals, birds, insects, fish etc.
- Give them 5 minutes to think and then write the answers on the blackboard while discussing with the students.
- These threats and problems may include -
  - Less food, lack of prey
  - Lack of water
  - Lack of shelter or habitat
  - Increased human activity in forests
  - Hunting/poaching by humans
  - Increased garbage
  - Decreased vegetation
  - Destruction of wildlife corridors (wildlife corridor- the area of the habitat connecting the wildlife populations from two or more wilderness areas, away from human activities or structures).
- Ask the students about the practical solutions to the threats and problems written on the blackboard. Ask leading questions, such as, why does the leopard come to the village/town/city? Why does it eat the goat? etc. Discuss such examples with the students.
- Students may give the following points as answers, but if any of the following points is missed, explain it to the students.
  - Preserve habitats of the animals
  - Decrease deforestation
  - Decrease the human activity in deep/core forests
  - Avoid disposal of garbage in the rivers, forests, streams, seas, or any natural site
  - Stop the hunting of the animals
  - Create water reservoirs in the forests
- After the discussion, ask the students to write the points in their notebooks.

Objectives:

- To help the students get an idea about the threats and problems affecting the wild animals
- To create awareness and concern about the non-human living beings

19 Animals from India and around the World

Indoor

Unit

Animals

Activity Duration

1 hour

Activity Month

October

Method

Discussion

Material

Map of India and the world, wildlife map of India and the world, notebook, pen, copies of the map of India showing borders of every state and state names for every student

Instructions for Teachers

- Study the distribution of animals in the various regions of India and the world.
- Study the wildlife map of India and of the world given below and at the website link provided for additional information. Make photocopies of these maps.
- Draw or buy a map of India showing borders of every state and state names for every student.

Activity

- Keep the map of India in front of the students and ask each one of them to tell the name of a state in India. Channel a discussion about different animals which can be found in different regions of India.
- Distribute the copies of the map of India and ask the students to think and write the names of animals found in each state.
- Now, keep the colour map given in the book (or its copies, if available) in front of them and ask them to see all the animals in each of the states.
- After looking at the map, ask them to name the animals found in each region, and write their names on the blackboard. Ask them to think about the habitats of these animals that can be associated with each animal. For example - the elephant is shown in Kerala and its habitat is the forest.
- Engage them in a discussion about the animals - habitat - state and prepare a chart similar to the one shown below.

Wildlife of India

(The chart given below is for reference only. Do not write it as is on the blackboard.)

Name of the State	Representative Animals
Jammu and Kashmir & Ladakh	Snow leopard Himalayan Black Bear Kashmir Stag
Himachal Pradesh	Himalayan Monal Himalayan Musk deer
Punjab	Blackbuck
Haryana	Blackbuck
Uttarakhand	Asian Elephant Yellow-throated Marten
Rajasthan	Great Indian Bustard Desert Cat Desert Fox Ratel

Objectives:

To help the students acquaint with the animals of India and of the world and their habitats

Name of the State	Representative Animals
Gujarat	Wild Ass Asiatic Lion Greater Flamingo
Uttar Pradesh	Sarus Crane Gangetic Dolphin
Madhya Pradesh	Tiger Forest Owlet Barsingha
Bihar	Gangetic Dolphin
Sikkim	Red Panda Blood Pheasant
Arunachal Pradesh	Clouded Leopard Bhutan Glory Butterfly Bugun Liocichla bird
Assam	Indian Rhinoceros Wild Buffalo Golden Langur
Nagaland	Amur Falcon
Meghalaya	Pygmy Hog
Tripura	Phayre's Leaf Monkey
Manipur	Sangai Rufous-necked Hornbill
Mizoram	Hoolock Gibbon
Jharkhand	Asian Elephant
West Bengal	Fishing Cat Tiger Water Monitor
Chhattisgarh	Wild Buffalo Bastar Hill Myna Sloth Bear

Name of the State	Representative Animals
Odisha/ Orissa	Oliver Ridley Turtle Irrawaddy Dolphin
Maharashtra	Tiger Great Hornbill Gaur Indian Giant Squirrel
Goa	Gaur
Andhra Pradesh & Telangana	Leopard Indian Pangolin
Karnataka	Asian Elephant Wild dog
Kerala	Asian Elephant Nilgiri Tahr Lion-tailed Macaque
Tamilnadu	Tiger Asian Elephant Salim Ali's Fruit Bat
Andaman Nicobar Islands	Narcondam Hornbill Dugong
Lakshadweep islands	Coral Reefs Brown Noddy

Indian ocean - Blue Whale
Indian coastal area - White-bellied Sea Eagle

Wildlife of India – Map

- The sizes of the animals on the map are not to scale and not to be compared with each other.
- The animals shown on the map are the representative animals of the respective state. In reality, each state has many more animals, and some of these animals are found in other states too.

- Now, keep the map of the world in front of the students and ask them to point to different continents and oceans with their names.
- Now, keep the 'map of the various animals found in the world' from the book in front of the students.
- Tell them that on this map of the world, the main animal found in a particular country is shown. Ask them the names of the animals according to the countries on the map and write them on the blackboard.
- The information about the animals found in India and the world can thus be shared with the students.

Wildlife of the World

(The chart given below is for reference only. Do not write it as is on the blackboard).

Continent	Representative Animals
North America	Grizzly Bear Brown Bear Puma/Mountain Lion Moose Arctic wolf
South America	Anaconda Jaguar Andean Condor Sloth Marine Iguana
Africa	African Lion African Elephant Wildebeest Giraffe Zebra Cheetah Mountain Gorilla Chimpanzee Hippopotamus
Europe	West European Hedgehog Reindeer/Caribou Eurasian Wolf Red Fox European Beaver Eurasian Lynx
Antarctica	Penguin Antarctic Leopard Seal Blue Whale
Asia	Tiger Asiatic Lion Giant Panda Asian Elephant Indian Rhinoceros Orangutan Barasingha Komodo Dragon King Cobra
Australia	Kangaroo Koala Platypus Dingo/Australian wild dog
Arctic	Polar Bear Harp Seal Wolverine Arctic Fox

Wildlife of the world – Map

Arctic

Wolverine

Polar Bear

Arctic Fox

Brown Bear

Moose

Arctic Wolf

Grizzly Bear

North America

Puma/Mountain Lion

Antarctic Ocean

Hippopotam

Anaconda

Jaguar

Chimpanz

Pacific Ocean

Marine Iguana

South America

Sloth

Andean Condor

Penguin

Arctic Ocean

arp Seal

North

West European Hedgehog

Eurasian Lynx

Eurasian Wolf

Reindeer/Caribou

European Beaver

urope

Asia

Red Fox

Giant Panda

Indian Rhinoceros

Asiatic Lion

Barasingha

King Cobra

ca

African Lion

Giraffe

Tiger

Pacific Ocean

Orangutan

Asian Elephant

Mountain gorilla

African Elephant

Indian Ocean

Komodo Dragon

Koala

eest

Zebra

Australia

Dingo / Australian wild dog

Kangaroo

Cheetah

Southern Ocean

Platypus

Blue Whale

Antarctic leopard Seal

Antarctica

The sizes of the animals on the map are not to scale and not to be compared with each other.

20 Story Telling (Dodo)

Indoor

Unit

Animals

Activity Duration

1 hour

Activity Month

October

Method

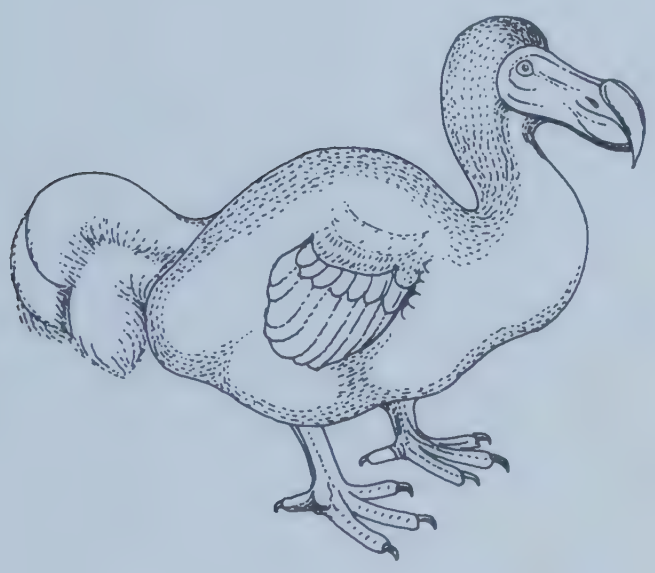
Story telling

Material

Notebook, pen

Instructions for Teachers

Before conducting this activity, read the story of the Dodo bird given below.



Objectives:

To create an awareness among the students about how excessive human interference and greed adversely affects the wildlife

Activity

- Read the following story about the Dodo bird to the students.
- After reading the story, ask the students what they have understood, what they feel, the mistake on the part of the humans in the story according to them, etc. Ask them to note this in the notebooks.
- Ask them what the impact will be on an ecosystem if a bird in it becomes permanently extinct.

The Story of the Dodo Bird

In the Indian ocean, there is an island named Mauritius, formed due to the volcanic eruptions. Nearly 300 years ago, this island was home to the Dodo, a bird species close to the pigeons. These birds, 3 feet tall and weighing more than 23 kilos, lived peacefully on this island, without dangers or threats of any kind. Hence, these birds had no need to fly. This flightless bird built nests on the ground and would survive on fallen fruits on the ground. The dense forest on this island had many species of birds, but no mammals at all.

In 1505, the Portuguese were the first humans to arrive on this island. The island became an important milestone in the spice trade routes. The sailors could easily get fresh meat of the Dodo birds and therefore these birds were killed in large numbers during this period.

Later, the Dutch turned this island into a prison and along with the criminals, they brought pigs and monkeys to this island. Many ships coming to this island used to be infested with rats, and thus the rats also got introduced to the island.

Before the arrival of the humans and the other mammals on the island of Mauritius, the Dodo had no threats and no predators. But now the situation changed as the Dodo eggs in the nests on the ground were under threat from the rats, pigs and monkeys.

Thus, due to the exploitation by the humans and the introduction of the new animal species on the island, the Dodo numbers reduced drastically. Within 100 years of the arrival of the humans on the island, the Dodo went from a 'majority species' to a 'rare species'. The last Dodo was killed in 1681 and the existence of the Dodo bird was wiped out from the face of the Earth.

In the 19th century, there was massive deforestation in Mauritius, to make way for the tea and sugarcane plantations. This pushed many other species of birds into extinction. Out of the 45 species of the birds found on the island, only 21 survive today.

Even though the Dodo became extinct in 1681, the story did not end there since it is only now that we are beginning to understand the effects of their extinction on the ecosystem of the region.

Some scientists have recently discovered that a particular plant

species, known as Calvaria, has become rare. Only 13 trees of this species exist today, and they are approximately 300 years old. After the second half of the 17th century, no new tree of this species has taken root. The average lifespan of this tree being 300 years, even the existing trees will die soon and then this species will also become extinct. There has been no new sapling of this tree in the last 300 years and the Dodo became extinct 300 years ago - is this a mere coincidence? No.

It was later found that the Dodo would eat the fruit of this tree and the seeds that were thrown out in its droppings would germinate and new saplings would take root. This means that the seed excreted after passing through the digestive system of the Dodo would be ready for germination. This fact shows the relationship of interdependence between a tree and a bird. 300 years ago, a species became extinct ending the interdependence and hence today there is a possibility that another species will be pushed to its end. It is hard to imagine how many more such species are on the path to extinction.

The Dodo is an excellent example of how the human interference can cause a species to become extinct in such a short time.

Some scientists think that the extinction of some other animal species for example, a species of tortoise, a species of bat, a species of parrot on this island have also contributed to the reduction in the number of the Calvaria trees. It is believed that these species too helped germinate the seeds of the Calvaria.

Fortunately, some scientists have found that the digestive system of the domestic Turkey acts in a similar manner on the seeds of Calvaria, to that of the Dodo. So, a few saplings of this tree, now known as the 'Dodo Tree', have been prepared using the Turkey. If these saplings survive, then we may succeed in saving the 'Dodo Tree.'

Important notice: At the end of this activity, remind the students to note the observation of the Sundial.

21 Decomposers

Indoor

Unit

Animals

Activity Duration

1 hour

Activity Month

October

Method

Discussion

Material

Notebook, pen

Activity

- Revise the concepts of the ecosystem, its components (living and non-living), the food-chains and the food web with the students.
- Ask any 2 students to come forward and write a food chain on the blackboard. Eg: grass → grasshopper → chameleon → snake → eagle or grass → deer → tiger
- After writing the examples, ask the students what happens when an eagle or a tiger dies?
- The students may answer that it would rot, turn into the soil, or emanate a foul smell, other animals would eat it, etc. Then ask them what exactly happens when something rots?
- If the students cannot answer, then ask them what happens if there is leftover chapati / bread / rice / vegetables that is kept untouched for a long time?
- When the students answer that the fungus grows on it, ask them about the complete process.
- Tell them that a chain process takes place. **Decomposer: fungus - bacteria - decomposition**. Write it on the blackboard. Now ask them what does it mean when something decomposes?
- If the students are unable to answer, tell them that the bacteria or the fungus turn the complex living organisms into simple non-living matter.
- Give the following information: the body of an animal is made up of cells, hence it is complex. The fungus breaks the complex body into various elements (carbon, phosphorus etc.) and mixes it with the soil. Hence, the decomposers play a very important role in nature.
- Then, ask the students whether they have seen a plastic bag or a piece of thermocol decomposing? Tell them that **the decomposers can break down only the organic matter (because it is natural).** Hence, the decomposers cannot degrade man-made things like plastic, thermocol, etc. and therefore garbage is seen lying around.
- Therefore, one should use as many natural things as possible.
- Ask the students to note down the points from the blackboard and the important points from the discussion in their notebooks.

Objectives:

To make the students aware about the decomposers and their importance in the nature

22 Types of Leaves

Indoor

Unit

Plants

Activity Duration

1 hour

Activity Month

October

Method

Discussion

Material

Paper, pen, pencil

Instructions for Teachers

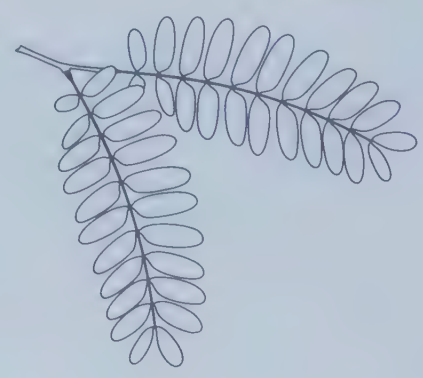
Before the activity, collect leaves of various trees from the school premises or from the surroundings, with the help of the students. These leaves should include simple and compound types of leaves. E.g. Gooseberry, Mango, Palash, Jamun, Babul, Meswak, Indian Coral Tree, Tamarind, Gulmohor, Wood Apple, Rhododendron etc.

Activity

- Begin the activity by giving a mango leaf and a tamarind leaf to the students for observation. Ask them the differences between the leaves. Ask them to carefully observe the petiole and the base of the leaf. Revise the activity from the Book 2.
- Ask the students to note that if **there is only one leaf above the bulbous part, then it is a simple leaf e.g: Mango; if there is more than one leaf above the bulbous part, then it is a compound leaf e.g: Tamarind.** Tell them that the smaller leaves in a compound leaf, like in that of a tamarind leaf, are called **leaflets.** Then show the other leaves to the students and ask them to find out whether there are any similarities or differences in the structure of these leaflets.
- Then tell the students that the petiole of any leaf is puffed or bulbous, it has stipules near it and the flowers emerge from the leaf axil. Then draw the sketches of Mango and Tamarind leaves on the blackboard and ask the students to draw them in their notebooks. Show the puffed or bulbous petiole and the stipules in the sketches.
- Then give them Palash, Indian Coral Tree, Flame Tree, Wood Apple, and Drumstick tree leaves. Tell them that the leaves of the Palash, Indian Coral Tree are compound leaves and they have groups of three leaflets. Hence, they are called trifoliate leaves.
- Show the students the paripinnate and imparipinnate leaves. E.g. paripinnate - the Flame Tree, Tamarind, Amaltash and imparipinnate - Drumstick, Rose and ask them to identify the differences between them. If they cannot answer immediately, ask them to count the leaflets and their pairs and based on this, explain the types of the compound leaf - **paripinnate (without) and imparipinnate (with) the terminal leaflet.**
- Ask the students to draw the sketches of these leaves in their notebooks.

Drumstick

Tamarind



Objectives:

To acquaint the students with the various types of leaves

23 Medicinal Plants

Indoor

Unit

Plants

Activity Duration

1 hour

Activity Month

October

Method

Interview, discussion

Material

Notebook, pen, pencil

Preparatory Activity

- 2-3 days before the activity, divide the class into groups of 4-5 students each and ask them to discuss with a local Ayurvedic doctor or local healers (in rural areas) who practise natural medicines/remedies, can also discuss with elders at home and collect the information on the following points and note it down in their notebooks:
  - Which medicinal plants are used throughout the year?
  - Which diseases are usually treated with the medicinal plants?
  - The uses of medicinal plants found in the surroundings of the houses
  - Where can one get these plants? Has the availability of the common medicinal plants changed over the years? Which plants have become unavailable now?
- Along with the students, try to see as many medicinal plants and medicines prepared from them as possible.

Instructions for Teachers

- Collect the information about the medicinal plants in the neighbourhood of village/town/ city and refer to the website link provided for additional information.
- Reference book:
  - Aushadhi Vanaspati, Sudhanshu Kumar Jain, Translation - VijaysinghPardeshi, National Book Trust, India.

Activity

- Ask the students whether they have collected information about the medicinal plants and ask each group to read it out in the class.
- Write the information that the students read out on the blackboard in the form of a chart as shown below.

Name of the medicinal plant	Which part of the plant is used	Medicinal use

- While writing the information, discuss it with the students. Ask them which plants out of the list have they used or have seen being used at home.
- Add the names and their uses from your own knowledge.
- Ask the students to find the **'versatile medicinal plants' - the plants which have multiple medicinal parts or the plant that is useful in treating multiple diseases** from the chart.
- Engage the students in a discussion about the need of such useful plants to be protected in the surroundings/forests.

Objectives:

To make the students aware about the medicinal uses of the plants

24 Review - 1

Indoor

Activity Duration

1 hour

Activity Month

October

Method

Quiz

Material

Notebook, pen

Instructions for Teachers

- Prepare a list of questions for a quiz. Include the questions from those given below and add new questions based on the previous activities.
- Reserve half the time for the quiz prepared by the students. The process and participation of the students is much more important than the number of questions they come up with.
- Ensure that all the students are present and participate in the review.

Activity

- Conduct a Quiz using the following questions.
- Divide the class into groups of 6-7 students.
- Ask them to sit with their groups and help them decide a name for their group - they may choose names of the flora/ fauna, for example, Orchid tree, Flame-of-the-Forest, Mango, Jamun, Deer, Tiger, Gaur, etc.
- Establish general rules for the quiz.
- Draw a score chart on the blackboard to note the points earned by each group.
- Questions like 'True or false', 'Fill in the blanks', 'Answer in one sentence' will get 1 point each and questions requiring a descriptive answer (questions with 'describe') will get 2 points.
- Ask each group to prepare quiz questions and to come forward and conduct the quiz.
- Thereafter, teacher can conduct the quiz as needed using the following questions:
  - Describe the classification of animals (any three types).
  - Name any eight elements in a mountain ecosystem.
  - Give two examples of the food chains in the forest ecosystem.
  - Give three examples of the interdependence between trees and other plants/birds/animals on each other.
  - How many types of forests are found in your state? Name them.
  - Name any eight elements found in a forest ecosystem.
  - State whether true or false: Mountain ranges perform the important function of a watershed.
  - Which type of forest is found in the village / town / city neighbourhood?
  - What are the various types of leaves?
  - Are the leaves of the Mango, Tamarind and Indian gooseberry, simple or compound leaves?
  - Give two examples of the food chains in the mountain ecosystem.
  - How many types of geographical regions are found in India?
  - To which type of geographical region does your taluka / state belong?
  - Name five elements in a marine ecosystem.
  - Give three examples of the food chains in the marine ecosystem.
  - What is a mangrove forest and where is it found?
  - Name the characteristics of a mangrove forest.
  - State whether true or false: Decomposers decompose the living organisms into simple non-living matter. True or false?

Objectives:

To help the students revise the previous activities

- Give three examples of the decomposers.
- Name four medicinal plants.
- Name the medicinal uses of any three plants.
- Name the wild vegetables found in your region.
- Name the largest and the oldest trees in your village/town/city.
- Name any ten animals/birds seen during the activity 'World of the Animals on an Old Growth Tree'.
- Can an old growth tree be called an ecosystem on its own?
- Where are the Rhinoceros found in India?
- State whether true or false: The national animal of our country is the Rhinoceros.
- Which animals are seen in the forest around us?
- What can be the threats and the problems faced by the wild animals? (Name 5 - 8 problems.)
- On which island did the Dodo bird exist?

Important note: Tell the students that they will be organising a 'seed exhibition' in the school in February. The students should start collecting various types of seeds that they can find in the surroundings or in gardens or in the village/town/city neighbourhood, in the fields/forest for the exhibition. While collecting the seeds, dry them and keep them in a paper or paper bag and write the name of the plant on it.

25 How is the Soil Formed?

Unit

Soil

Activity Duration

1 hour

Activity Month

October

Method

Discussion

Material

Notebook, pen

Instructions for Teachers

- Refer to the website link provided for additional information.
- Study the diagram in the activity 'Observing the layers of the soil' from the Book 1 again.
- Identify 3 medium sized and 3 small sized hard rocks in the school campus; do not select brittle rocks.

Activity

- Revise the concept of the various **layers of soil** by drawing the diagram on the blackboard.
- Ask the following questions to the students:
  - How would the soil have formed from the rocks in the lowest layer?
  - How much time would it have taken approximately?
- Tell them that they will be conducting a practical experiment.
- Take the students to the school ground and divide them into 3 groups.
- Give each group a medium sized rock and a small rock. Ask them to break the smaller rock with the help of the bigger one.
- Ask them to be careful so that no one is injured in this activity. Allocate about 5 to 7 minutes for this activity and tell them to observe whether the rock breaks down.
- After the activity, take the students back to the classroom and ask them if it was easy to break the rocks. Now ask them to imagine that if they take so much time to break such a small rock, how much time will it take for a rock to turn into soil naturally. Now tell them that it takes **a minimum of 300 to 500 years for a rock to turn into soil.**
- Then ask the students some leading questions as follows:
  - How is the soil formed?
  - Which reactions do the large rocks undergo?
  - What happens in the beginning of the process?
  - How does the rock break before turning into a fine powder?

  Engage them in a discussion about this process.
- Then tell the students that a rock wears out due to contact with water, wind, Sun rays. And because of this, minute cracks which are invisible to the naked eye start appearing on it. This causes physical and chemical weathering of the rock which takes approximately 50-60 years.
- Then, draw a sketch of a cracked rock on the blackboard and ask the students what would happen next?
- If the students cannot answer, tell them that moss and lichen (type of plant) starts growing on the rock and begins to break down a very thin layer on the rock.
- As the moss and lichen grow on the rock, some grass starts growing either on the rock or around it and the minute cracks on the rock start growing bigger.
- Once the grass grows on the rock, the seeds of various plants that are carried by the wind or water get trapped in the cracks and some seeds germinate.
- Due to the covering formed by the moss, lichen and grasses, the top layer of the rock starts loosening and gets lighter. The roots

Objectives:

To help the students understand that the formation of the soil requires a long period of time and hence the soil conservation is very important

of these plants trap the small stones carried by the water and the soil particles. A **shelter/habitat is thus created and helps germinate** seeds of plants.

- Once the seed of the plant/shrub germinates, these small cracks start to widen. This process creates a large crevice in the rock and the rock breaks into two parts. Some small particles, leaves accumulate in these cracks and lead to more and more wear out of the rock. This is how the rocks start turning into soil slowly.
- Explain to the students that since it takes such a long time for soil formation, soil conservation is of paramount importance.

26 Groundwater Reserves

Indoor

Unit

Water

Activity Duration

1 hour

Activity Month

November

Method

Discussion focusing on an image

Material

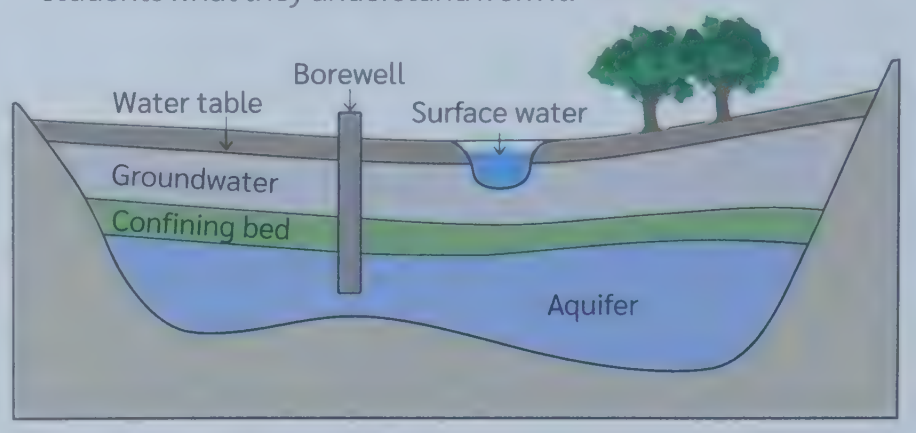
Pen, notebook

Instructions for Teachers

- Study information about the 'Groundwater'.
- You can take the students for a field visit in December/January to show them the springs in the wells as an extension of this activity. The students can also undertake an exercise of measuring the ground water level in the well every month with the help of the Ground Water Survey Department of the district.
- Refer to the website link provided for more information.

Activity

- Ask the students what is a borewell/a well and ask them leading questions as follows:
  - From where do they receive water for daily use?
  - What happens to the rainwater reaching the ground?
- The students would normally answer that the water seeps into the ground, it is used by the plants, it flows away, or it gets accumulated, etc.
- Now ask the students which factors are important for the water to seep into the ground. E.g. would the water seep faster into the soil on the playground or in the fields? Why?
- Ask the students, from where does the well/borewell receive water and once the water in it gets exhausted, how much time does it take to recharge the well? How does the water in the well or borewell gets recharged?
- Ask the students how deep is a well/borewell? If there is a well/borewell in the village/town/city neighbourhood, ask the students to estimate its depth.
- Draw the diagram given below on the blackboard and ask the students what they understand from it.



- Then introduce the term **'groundwater'** to the students and tell them that the types of wells discussed earlier (well/borewell) are the ways in which the groundwater is used.
- Explain the importance of the aquifer and the water table shown in the diagram to the students. Also explain how the wells get recharged and how water is extracted from them by using the following information -
  - **Aquifer:** The basalt/igneous rock is non-porous and so the rainwater that falls on it does not seep in but accumulates over the surface. Wherever there is a layer of porous soil, the water seeps in. But it gets accumulated wherever it encounters a basalt rock and such a water filled layer is called an aquifer.
  - However, if there is a porous rock, i.e. a laterite rock, then the water seeps right through it, reaches deeper and accumulates there.

Objectives:

To help the students understand the importance of the groundwater and why it is necessary to preserve it

- Explain to the students that if the groundwater in a particular region gets exhausted, then it would be impossible for the human beings to survive. In order to replenish the groundwater levels, it is important to maintain as much green cover on the ground as possible, since it is due to this layer on the ground that the rainwater can seep into the ground.
- Ask the students to write these points in their notebooks.
- If there is a well in the surroundings, ask the students to measure the water level with the help of a string or a rope. Make sure that all the necessary care and precautions are taken while conducting this activity such that the students do not endanger themselves by standing too close to the well. A chart of the water levels of the well can be prepared for a year by recording the water level of the well every month.

27 Traditional Water Management

Indoor

Unit

Water

Activity Duration

1 hour

Activity Month

November

Method

Sketches and discussion

Material

Notebook, pen

Instructions for Teachers

- Refer to the website link provided for additional information and study the various traditional water conservation/ water management techniques.
- If possible, request the Art teacher to sketch the various traditional water conservation/water management techniques in India on the blackboard or cardboard.
- Collect the information about the history of your village/town/city and the water management practices followed earlier. Find out about the history of the water sources in the surroundings, streams that used to flow earlier but have now dried up, streams that used to flow throughout the year (perennial) earlier but that now flow only for a few months.

Activity

- Ask the students whether the water management techniques that they see around them now and the water management techniques that were used in the past can be the same. Ask leading questions as follows and engage them in a discussion:
  - The dams that exist now, did they exist earlier?
  - How was the river in the past? Was its flow obstructed or was it free-flowing?
  - How would the water be stored in the village/town then?
- If the village/town does not have any modern water distribution system or a dam or taps, etc., discuss the existing water management system along with its advantages and disadvantages. This question is not for the city. But students can relay stories from other places if they have read/seen it.
- Ask the students about the methods that are used in the existing system in your village/town/city for distribution of the water.
- Write all the answers on the blackboard.
- Then explain the various traditional water conservation / water management techniques given in the additional information by drawing their sketches, if possible, on the blackboard.
- Now ask the students which traditional techniques can be used locally and ask them to write the information from the blackboard in their notebooks

Objectives:

To make the students aware that the water conservation/water harvesting techniques used in India since the ancient times were developed considering the scientific, geographical, social and natural factors of the region

Important note: At the end of this activity, check if the students have been collecting seeds as instructed. Remind them to note the observations of the Sundial.

28 Climate and Farming

Indoor

Unit

Weather - climate

Activity Duration

1 hour

Activity Month

November

Method

Discussion

Material

Pen, notebook

Instructions for Teachers

Find information about farming techniques in different regions of India. E.g. farming in the Himalayas, shifting cultivation on the mountain slopes and farming on the plateau etc.

Activity

- Ask the students in which type of region do they live? Plateau or mountainous region or plains?
- Then ask them whether the farming techniques in every region are the same or do they differ as per the region?
- Ask the students what type of farming technique is used in the region in which they live. After the discussion, tell them about following farming techniques based on the climate in that region.
- **Shifting Cultivation:** This is an ancient technique in use since humans first started farming. In the mountainous regions where forests were abundant, the humans cleared patches of forest and used the land for farming. Wherever the forest had the capacity to regenerate in a short time span, the piece of land on which farming was practiced was used temporarily for a few seasons. This means, after cleaning the forest and farming on a plot for 2-3 years, another part of the forest was cleared. By the time 5-6 such plots of land were claimed and used one after the other, the first plot of land would have regenerated into a forest, which would be cleared again for such rotational and temporary farming. Main crops: Ragi, Barnyard millet, Sesame.
- **Paddy Cultivation:** Paddy requires a lot of water and hence paddy farming is practiced in the region with high rainfall. First, a stream is diverted, blocked or bunded to create small fields for the paddy. The paddy seeds are planted in the puddled soil created in these fields and the bunds are made in these fields to retain the required amount of water.
- **Farming on Plateau:** Since this is a level ground, commercial farming is possible at a large scale.
- **Farming in the Cold Climate Regions:** In cold climate regions like the Himalayas, small fields are prepared for farming and **shifting cultivation** is also practiced to a certain extent. The farming is done at two different places in the winter and in the summer. In the winters, this region receives snowfall and hence the people in this region relocate to the foothills for warmth. In the summers, they move back to the higher elevations in the mountains, so that the farm can benefit from as much sunlight as possible. Thus, these people have two houses and practice farming in two places - in the mountains during the summers, and in the foothills of the mountains during the winter. Main crops: Ragi, Amaranth, Peas, Potato, Rajma.

Objectives:

To introduce the students to the varied farming techniques in India

(Shifting Cultivation) :

Farming on the Plateau

Paddy Cultivation :

Farming in the Cold Climate Regions

29 Plantation Planning in the Backyard

Indoor

Unit

Plants

Activity Duration

1 hour

Activity Month

November

Method

Discussion, planning and organisation

Material

Notebook, pen, pencil, a big sheet of blank paper, colour pencils/crayons

Preparation for the activity

2-3 days before the activity, ask the students to prepare a map of the space around their house/backyard and a list of the existing plants.

Activity

- Tell the students that today they are going to do plantation planning for their houses.
- Check whether all the students have done the homework for this activity and ask them to write the names of the plants around their house in the notebook.
- Ask them which type of vegetation would they choose to plant in the empty spots around their house/neighbourhood? Engage them in a discussion about the types of the plants that they can choose from - plants useful to them, or to the animals and birds or those with medicinal uses?
- Now, ask them to prepare lists of the plants that can be planted in the neighbourhood as follows:
  - Plants useful to the animals and birds
  - Medicinal plants
  - Plants useful for the household
  - Plants useful for the personal use, etc.
- Ask them to include trees, climbers, shrubs and grasses in these lists.
- Check the lists prepared by the students and ask them to select the plants for their backyard from these lists.
- Then ask the students to draw a map of the area/space around their house/backyard on a blank sheet of paper or drawing book. Ask them to mark the existing plants in one colour and the plants to be newly planted in another colour on this map. As an example, draw a part of the map on the blackboard.
- While preparing the plantation plan, ask the students to also take into consideration the height of the plants, requirements of sunlight and group together the plants of similar use (for example - medicinal plants in one location, and plants used in the kitchen in another).
- Check the plans prepared by the students and make modifications if necessary.

Objectives:

- To help the students prepare a plantation plan for their own house using the knowledge of the plants acquired
- To strengthen the decision making and planning abilities of the students

30 The Green Revolution

Indoor

Unit

Agriculture

Activity Duration

1 hour

Activity Month

December

Method

Discussion, writing

Material

Notebook, pen

Instructions for Teachers

- Before conducting the activity, read additional information about the Green Revolution given below.
- If you can find any articles or information about this topic, collect them as the reading material for the students.

Activity

- Write **'The Green Revolution'** on the blackboard and ask the students what they know about it.
- Write the answers given by the students on the blackboard. Then tell them the following points -
  - It was Norman Borlaug (1914-2009), an American agronomist who initiated the Green Revolution. He is known as the 'The Father of the Green Revolution' and was awarded the Nobel Peace Prize in 1970 for his work.
  - The objective of the Green Revolution movement which originated between 1940 to 1960 was to increase the agricultural yield.
  - Through the 'Green Revolution' movement, the farmers received hybrid seeds along with chemical fertilizers, and planning techniques for agriculture etc. This resulted in increased yield.
  - The first trial of the Green Revolution in India was carried out in 1961 - the very reason for it to be introduced in India was the famine that year. Punjab was the state selected for this trial for two reasons - firstly, there was no shortage of water in Punjab and secondly, its very fertile soil meant that the agricultural yield was already high.
  - The hybrid seeds of wheat and rice were imported for these trials and gave 50 times higher yield than that of the native seeds.
  - The Green Revolution was highly beneficial to the large scale farmers in India, as a very high yield resulted in the grains being exported and therefore their income grew. **The 'Green Revolution' was profitable for a short period, but its impacts were not properly pre-assessed.**
- After this discussion, ask the students what they think were the ill-effects of the Green Revolution? If they cannot answer, tell them the following points -
  - Due to the cultivation of the same type of crops and overuse of the chemical fertilisers, the soil quality started degrading.
  - The biodiversity was destroyed due to increased use of chemical pesticides, which affected the animals and birds around the farms and their numbers declined.
  - Due to the overuse of water, the groundwater levels depleted drastically. In the past, the groundwater was available at 30-40 feet, but later it is not found up to 250-300 feet.
  - The farmers had to buy the hybrid seeds every year from the market. In addition, due to the degraded soil quality, the yield also started declining.
- At the end, ask the students to note these points in their notebooks.

Objectives:

To introduce the students to the Green Revolution

31 Agriculture: Newspaper Reading

Indoor

Unit

Agriculture

Activity Duration

2 hours

Activity Month

December

Method

Reading, writing and discussion

Material

Newspaper, notebook, pen

Instructions for Teachers

- Collect 4-5 newspapers from the previous week. (Try to get a newspaper/magzine focusing on agriculture).
- Before the activity, read the news related to agriculture.
- Refer to the website link provided for additional information for some articles on agriculture, but they may not be relevant to your state/local region.

Activity

- Divide the class into groups of 4-5 students and give one newspaper to each group.
- Ask the students to read the news articles related to agriculture and make a summary of the articles. Allot 15-20 minutes for this and then ask each group to present the summary before the class.

  OR
- Ask some students to read out the news related to agriculture and discuss the salient points in them. Participate in this discussion and try to connect it to the other activities related to agriculture. Ask the students to write these points in their notebooks.

Objectives:

To make the students aware about the current trends and the new technologies in agriculture

Important note: At the end of this activity, check that the students have been collecting seeds as instructed. Remind them to note the observations of the Sundial.

32 Traditional Seed Varieties

Outdoor

Unit

Agriculture

Activity Duration

2 hours

Activity Month

December

Method

Field visit, discussion / interview

Material

Notebook, pen

Instructions for Teachers

Identify a settlement/village/Gram Udyog Kendra near the school where students can meet the farmers and/or see old and traditional varieties of seeds. Ascertain a time for the visit and inform them that the students would like to interview them. If there is no such place accessible, try to find a farmer or someone who can talk on this topic to the students.

Activity

- Revise the learnings and observations from the market visit, seeds seen at that time, their procurement, interactions with the farmers etc. (from the Book 2).
- Inform the students that in this activity, they are going to visit the nearby settlements/village/Gram Udyog Kendra to get to know about the old and traditional varieties of seeds.
- Ask the students what they understand by **"old and traditional varieties of seeds"?**
- After they answer, channel the discussion towards the questions to be asked to the farmers/villagers/Gram Udyog authorities and make a note on the blackboard:
  - Which crops and vegetables are cultivated in the farms?
  - From where are the seeds obtained? Are the seeds your own or bought from the market?
  - Do you have to buy the seeds every year from the market? Why?
  - What is the quantity of seeds that you require at a time (in one season) and how much does it cost?
  - Have you been using this variety of seeds since you started practicing agriculture? If not, then which variety was used earlier? What were their names? Do their names have any particular meaning?
  - Was there a specific reason for using the old varieties of seeds? For example, for their medicinal value, better taste, or did they fetch a better price, etc.
  - Why did you change from the older variety of seeds to the new varieties?
  - What did it change - yield, taste? Did the new produce have better qualities?
  - Were there any disadvantages of using the new varieties of seeds? If yes, what were they? E.g. low yield, degraded soil quality, increased need for fertilisers, degraded taste or the increased input costs?
  - Can they use the old varieties of the seeds again?
- Tell the students that they should try to ask these questions to the elderly people in the village (in case of a village visit) to get detail and elaborate information.
- Then take the students into the village/Gram Udyog Kendra, divide them into groups and ask them to interview the villagers. Ask them to write the important points from the discussion in their notebooks.
- If any of the villagers has conserved the old and traditional varieties of the seeds, have a look at them and observe their colour, shape, smell etc.
- After the students have finished their discussions, regroup them and discuss the information they have gathered. Tell them about the old and traditional varieties of the seeds, their uses and importance.

Objectives:

To familiarise the students with the old and traditional varieties of seeds in the region, their uses and importance

33 Minerals found in India

Indoor

Unit

Soil

Activity Duration

1 hour

Activity Month

October

Method

Discussion, map reading

Material

Map of the Minerals found in India (Metallic and non-metallic), notebook, pen

Instructions for Teachers

Read information about the minerals and make copies of the maps provided on the next pages.

Activity

- Begin the class by asking the students – **What are minerals?**
- If they are unable to answer, explain to them that the rocks which we see in our surroundings/nature have chemical substances in them which can be useful to the human beings. These chemical substances in the rocks are the minerals and are obtained by doing various processes on the rocks.
- There are **two types of minerals – metals and non-metals.**
- Write these two terms on the board and ask the students what metals and non-metals are and write the answers on the board.
- **Metals: iron, lead, copper, gold, bauxite, silver, etc.**
  Non-metals: mica, gypsum, asbestos, cadmium, etc.
- Once the above list is ready, explain the difference in the process of formation of the metals and the non-metals.
- Now display the Map of the Minerals (Metals and Non-metals) found in India and ask them to prepare a list of the minerals and the rocks found abundantly in various states.
- Explain to the students that all these metals and non-metals came into existence at the time of the formation of the rocks and that their **reserves are limited.**

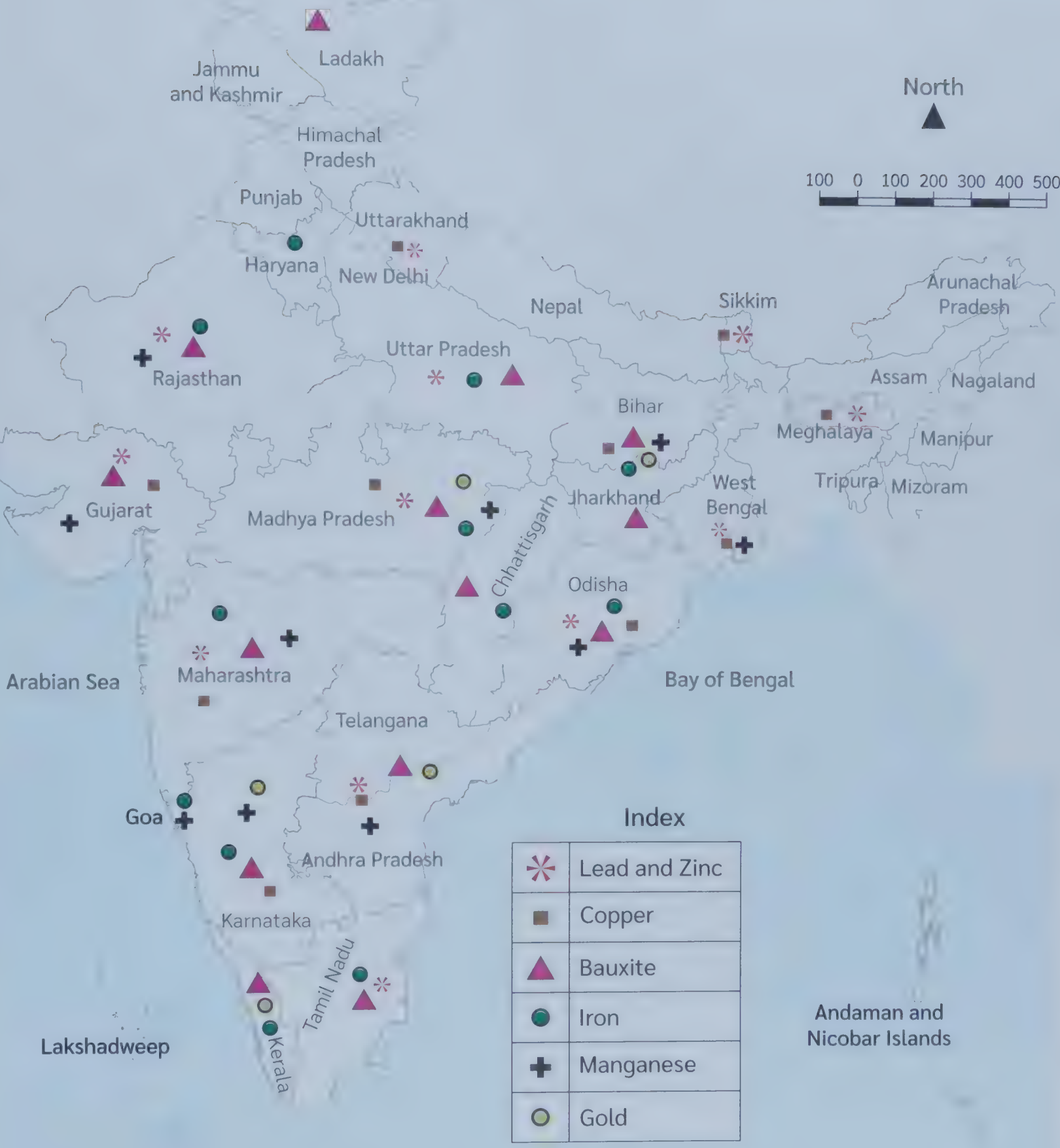
State	Metal	State	Non-Metal

- Once this chart is ready, tell the students that the human beings use these metals and non-metals to produce a huge range of products and if the reserves are exhausted, there will no longer be any minerals left for the usage of the humans.
- It is therefore crucial to use the minerals for appropriate and important purposes only. And such minerals need to be reused/recycled.

Objectives:

To help the students understand the diversity of minerals found in India

Metals found in India



Non-metals found in India

34 Marine Ecosystem: Part 2

Outdoor

Unit

Ecosystem

Activity Duration

1 hour

Activity Month

December

Method

Field visit, discussion

Material

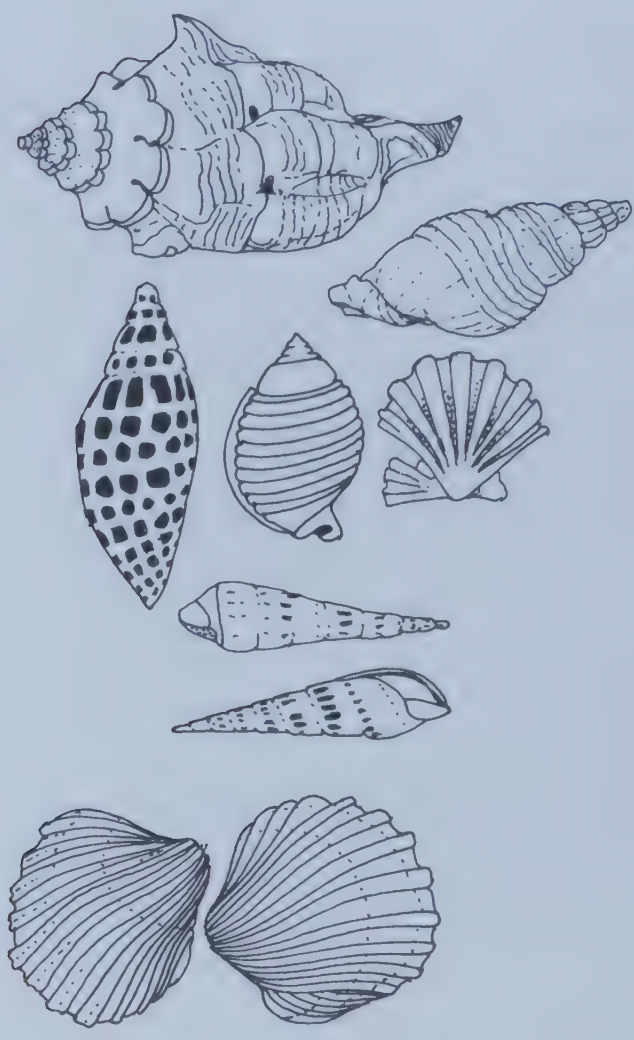
Notebook, pen, binoculars (if available), measurement tape

Instructions for Teachers

This activity is to be conducted as the earlier one, Marine Ecosystems: Part 1.

Activity

- Revise the activity "Marine Ecosystems: Part 1" from this book.
- Conduct this activity in the same way as the earlier activity.
- Engage the students in a discussion around the variations observed in the components of the marine ecosystem in the current season.



Objectives:

To introduce the students to the Marine ecosystems and to help them understand the transitions occurring in these ecosystems in various seasons

Important note: at the end of this activity, check that the students have been collecting seeds as instructed. Remind the students to note the observations of the Sundial.

35 Map and Survey of a Settlement

Outdoor

Unit

Settlement

Activity Duration

2 hours

Activity Month

December

Method

Hands-on work

Material

Drawing paper, pen, pencil, colour pencils or sketch pens, ruler, measuring tapes or meter tapes

Instructions for Teachers

- Find a settlement or a small village nearby.
- The place should be such that the students should be able to draw it in the form of a map in their notebooks. (If a small village or settlement is not nearby, consider an area/colony that is near the school and ask the students to draw its map).
- Arrange for a volunteer to work with every group.

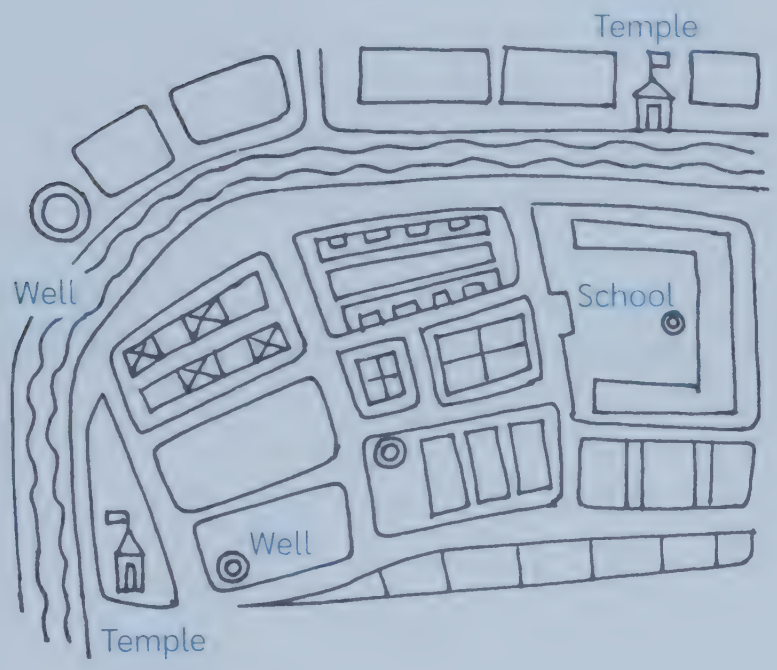
Objectives:

- Hands-on experience about scales, measurements, layout of a village/settlement, a sense of direction
- Analysis of different components of a village/settlement
- To weigh, convenience offered, and pollution produced by these features and components

Activity

- Take the students to a nearby village/settlement.
- Introduce the activity of map-making and divide the class into groups of 4-5 students each. Ask each group to select an area or a street in the village and draw a map of it.
- Give a specific name/number to each group and provide them with some papers.
- First, talk to the students about the understanding and orientation of the directions and to identify the four main directions on site. Ask them how directions are shown on a map and then mark them on the map.
- Then inform that they need to measure the following (they can take measurements with the help of a metre-scale or by measuring with footsteps):
  - Main roads – measure (length and width)
  - Narrow roads – measure (length and width)
  - Open spaces/fields or grounds – measure (length and width)
  - What is the distance between two houses?
  - If there is a river or a stream or a pond, what is the distance from the houses or road to the river/stream/pond?
  - In case of coastal settlements, what is the distance between the houses and the sea?
  - Mark the wells, handpumps, borewells, public water taps, temples, schools, etc. on the maps with the help of different symbols.
  - Also mark garbage dumps, polluted water, green cover, types of shops (selling clothes, groceries, buying old paper, etc.), public toilets, public facilities such as central meeting place, village office, places where the birds can be observed, and where they nest, etc.
  - Ask the students in each group to write their names and their group name and number behind the map.
- After giving these instructions, ask the students to go to different parts of the village/settlement in their groups, accompanied by a volunteer and to draw the map. Give them 30-35 minutes for this activity.
- Once the students come back with their maps, engage them in a discussion about the components and the places that they liked and which they think are a necessity. Ask them to mark such places with a green coloured tick mark (✓) E.g. roads with green cover, drinking water facility, public toilets, places where birds can be observed, etc.

- Then ask them the places that they did not like, and which were unclean, and ask them to mark such places with a red coloured cross mark (✕) E.g. overflowing garbage dump, garbage thrown around everywhere if a dump is not available, open drainages of sewage water, roads without green covers, etc.
- Now engage them in a discussion around how to improve the places with a red coloured cross mark (✕) and expand those places marked with a green coloured tick mark (✓).
- Collect the maps prepared by the students and display them on the bulletin board in the school.



36 Season Cycle

Indoor

Unit

Climate- Weather

Activity Duration

1 hour

Activity Month

January

Method

Discussion, writing, group learning

Material

Notebook, pen

Instructions for Teachers

Read information about the months according to the Indian calendar system and how it relates to the various seasons.

Activity

- Ask the students to name the 12 months as per the Gregorian calendar and note them on the board, one below the other.
  - January, February, March, April, May, June, July, August, September, October, November, December.
- Now ask them to name the month (according to the Gregorian calendar) in which the New Year Day as per the Indian/your regional calendar falls. After they answer, mark a symbol in front of the month they mention. Now ask them to name of the corresponding month according to the regional calendar/ language. Eg: If the new year day falls in 'March', write 'Chaitra' besides March.
- Thereafter ask the names of other months as per the Indian calendar and write their names beside the corresponding 12 months of the Gregorian calendar, as shown in the chart below.
  - Chaitra, Vaisakha, Jyaistha, Asadha, Shravana, Bhadra, Ashwin, Kartika, Mārgasirsa (Agrahayana), Pausha, Magha, and Phalguna. The names may differ in every state.
- Then ask the students to name the seasons as per the Indian system. Ask them in which month the first season Vasanta begins and note its name beside that month in the chart.

English Months	Regional Months	Seasons	
February March	Phalguna Chaitra	Vasanta	Summer
April May	Vaisakha Jyaistha	Grishma	
June July	Asadha Shravana	Varsha	Rainy season
August September	Bhadra Ashwin	Sharad	
October November	Kartika Mārgasirsa (Agrahayana)	Hemanta	Winter
December January	Pausha Magha	Shishir/ Shita	

Objectives:

To be able to correlate the different seasons, the months as per the Indian and the Gregorian Calendar systems

- At the end, also write the names of the seasons that are known to everyone - summer, rainy season and winter as per the months in which they fall.
- After writing the above on the board, ask the students to find the interrelation between the three lists – which season falls in which month as per the Indian calendar and the Gregorian calendar.
- Engage them in a discussion about the relation of the seasons with the following examples:
  - Changes in nature
  - Natural produce available, like vegetables and fruits
  - Natural phenomenon like life cycles of the plants and animals
  - Festivals of various religions celebrated in the village/town/city
  - Diet in every season
- Ask the students to copy this chart in their notebooks and also to make a large one on a chart paper and display it in the class.

37 Water Management in the Town

Indoor

Unit

Water

Activity Duration

2 hours

Activity Month

January

Method

Interview, collecting information

Material

Notebook, pen

Preparatory Activity

- 2-3 days before this activity, ask the students to discuss the following at home and with the elders in the village/town/city and collect the following information:
  - What is the population of your village/town/city? How many houses are there?
  - How much rainfall does the village/town/city receive?
  - Which crops do the people cultivate in your region? In which seasons? Do the crops require a lot of water or less water?
  - How is water stored in the houses?
  - Is the drinking water stored at homes changed daily or is the water stored earlier also used?
  - Which water sources are used throughout the year?
  - Is water stored at the village/town/city level and how is it stored?
  - Is water lost due to leakage or wastage? Where does it take place and how much water is lost?
  - Are there any springs which have gone dry now or those that flowed throughout the year but flow only for a few months now?

Instructions for Teachers

- Check the sources of information like the Gram Panchayat, Tehsildar Office or Government Office where the students can obtain information about the water and its management.
- If the due permissions for a visit are obtained, take the students to the government office and if not, invite the government official to visit the school so that the interview can be conducted.
- If the concerned officer from the government is not available, obtain information from the people in the village/town/city who can provide accurate details about the water management.

Activity

- Explain the purpose of this activity to the students and ask them to make a list of questions for the interview, allocate 10 minutes for this task.
- Check the questions listed by the students, select the important ones from the list and tell them to ask these to the official.
- Here are some probable questions that can be asked – help the students if required:
  - Are there any dams in or around the village/town/city? How many? Name the dams.
  - What is the water storage capacity of every dam?
  - If there is no dam in the village/town/city, what is the source of the water?
  - How is the water from the dam or the water source transported to the village?
  - How much water should each person receive every day? And in reality how much does every person get?
  - Is there an arrangement for separate water for farming?
  - How is the waste or sewage water managed in the village/town/city?
  - Are there any industries nearby or in the surroundings? Where do they receive water from?
  - Which crops are cultivated in the village and how much water do they require?
- Introduce the concerned official to the students before the interview and request him to explain the water management system in the village/town/city to the students.
- Ask the students to write the answers received during the interview in their notebooks.

Objectives:

To help the students understand the water management system practiced in the village/town/city

- After the interview and the discussion, ask the students to answer the questions which were given as an assignment for homework one by one. Discuss the water management system in the village /town /city and the water usage at home and in farms.
- Now ask them what they can understand from this discussion, can they imagine the water usage of the town as a whole? Compare it with the rainfall. Tell them to note important points from the discussion in their notebooks.

38 Types of Renewable Energy Sources

Indoor

Unit

Energy

Activity Duration

1 hour

Activity Month

January

Method

Discussion

Material

Notebook, pen

Instructions for Teachers

- Read information about the renewable sources of energy given below.
- Collect images of as many sources of energy as possible.

Activity

- Revise the activity "Renewable and Non-renewable Sources of Energy" from the Book 2. Start with a discussion of the types of energy sources used by us daily. Then write the word **'Renewable'** on the board and ask its meaning to the students. If they cannot answer, break the word into two parts **'renew'** and **'able'**, so that they understand the meaning.
- Ask the students to name the sources of renewable energy.
- Write the answers given by the students on the board and inform them that they will be learning about solar, wind, biomass and tidal energy today.
- **Solar Energy :**
  - Ask the students what is solar energy? Where is it used? What are some of the problems encountered in its use?
  - Once they answer, give the following information to them.
  - Solar energy can be used to cook food, heat water, produce electricity, etc.
  - India is a tropical country, and the sunlight is available for more than 8 months in a year. If this sunlight is used appropriately, then the issue of the energy shortage may be partially resolved in our country.
  - This energy can be stored in the **'Solar Photovoltaic Cell'** in which solar energy is converted into electrical energy and can be used in street lights, electrical appliances, etc.
  - However, it is more beneficial if the solar energy is used directly, without processing it in any way or without using any object or machine. Solar energy can be directly used to heat water or drying clothes as is.
  - One cannot depend on this energy for all the 12 months of the year, as during the monsoons, this energy may not be available for 2-4 months.
- **Wind energy :**
  - Discuss the meaning of the wind energy with the students and ask them if they have seen the wind turbines. Then give the following information to the students:
  - The wind rotates the blades of the wind turbine and electricity is generated.
  - The wind turbines are structurally similar to the fans we use.
  - The wind turbines are generally installed on mountain ranges, if not on the flat land where the highest wind speeds are recorded.
  - However, there are some shortcomings of this type of energy:

Objectives:

To introduce the students to the renewable energy sources - solar, wind, biomass and tidal energy

- ✦ In case of no wind scenario during some seasons, electricity cannot be produced.
- ✦ Large wind turbines have to be installed at high altitudes on the mountains or hills where the wind is unobstructed, and so roads need to be built to the top of the mountains or hills and all the natural components like the forests and soil get disturbed.
- ✦ A solution to this shortcoming is to install small wind turbines in small villages or settlements so that the energy needs of the village are met.
- ✦ Apart from producing electricity, the windmills can also be used to pump water from the wells or borewells and this direct use of wind is much more advisable.

▶ **Biomass Energy :**

- The energy produced from the renewable organic material i.e. energy obtained by burning wood, leaf litter, oil produced from the seeds of plants like Pongamia pinnata, Mahua, Jatropha curcas, biomass from the farms e.g. Jowar ears, biomass from the sugar mills i.e. sugarcane bagasse, etc.
- Plants produce energy through photosynthesis in the form of food which is stored in them. This energy is used as the biomass energy.
- Wood has been used as a source of energy from time immemorial, but its use entails emission of gases like carbon dioxide into the air.
- The methane obtained by decomposition of wet/organic waste is also used as a source of biomass energy.

▶ **Tidal Energy :**

- This is a relatively new type of energy, and the research is still being conducted in this field.
- This energy is generated by harnessing the motion of the sea waves.
- Sea or ocean waves have tremendous energy which can be used to rotate the turbines to generate the electricity.

Important note: at the end of this activity, check that the students have been collecting seeds as instructed. Remind the students to keep noting their observations of the Sundial.

39 History of Industry and the Twelve Tradesmen (Balutedar)

Indoor

Unit

Industry/Occupations

Activity Duration

1 hour

Activity Month

January

Method

Discussion, writing

Material

Notebook, pen

Instructions for Teachers

Read information about the different cottage industries/occupations and the twelve tradesmen (balutedar) system. Try to find out about this system local to your region.

Objectives:

To introduce the students to the various occupations/industries that existed in the villages in the past

Activity

- Start the activity by asking the students the meaning of the word 'occupation/industry'.
- Ask them about the occupations or the industries that they observe in the surroundings and write the answers on the board.
- Ask them about the various occupations/industries that existed in the villages in the past and if they know any, write them on the board as well.
- Explain the following about the occupations-
  - Before Independence, the modern day industries did not exist in the villages and there was a ***Balutedar system*** in the past. (Balutedar is a Marathi term). But such systems existed in all the regions/states in the country. *Teachers should use the local context.*
  - All the core occupations were under the 12 Balutedars (tradesmen) in this system and they used to meet the needs of the entire village. The occupations may vary region to region in India (refer to the local context).
  - Now write the word Balutedar (or local term) and the names of the 12 Balutedars (Tradesmen) on the board.
- Ask the students to describe the kind of work done by each tradesman and write it on the board beside the name of the Tradesman. Help the students if they are not aware of the answers:

1. **Goldsmith** - a person who makes, repairs or sells articles of gold
2. **Priest** - for daily work related to the shrines.
3. **Barber** - a person whose job is to cut hair and shave men's beards
4. **Washerman** - a person who washes clothes
5. **Potter** - a person who makes pots and other objects from baked clay
6. **Carpenter** - a person who makes things from wood
7. **Ironsmith** - a person who makes and repairs objects from iron
8. **Cobbler** - a person who makes and repairs shoes
9. **Fisherman** - a person who transports water
10. **Assistant/ Helper** - (Assistant to the village head) - a person responsible for gathering a crowd in the village for a given reason
11. **Guard/ Helper** - a person in charge of village security, watching farms, helping in navigation, and other odd jobs (for rich guests in the village).
12. **Astrologer** - in charge of finding the opportune moment for a religious or other type of function.

- After writing this list, explain to the students that if someone from the village were to get some work done from these tradesmen, they were not paid in cash but were compensated in the form of grain, fruits, food, clothes, etc.
- Ask the students to copy this information in their notebooks.
- Inform them about another advantage of this system - in the past, people used the local goods, as the shops or the malls did not exist and therefore the money was exchanged only within a village or nearby villages.

40 Past and Present Industry Types

Indoor

Unit

Industry

Activity Duration

2 hours

Activity Month

January

Method

Discussion, writing

Material

Notebook, pen

Instructions for Teachers

- Read information about the names of various occupations/industries and the kind of work involved in detail. E.g. masonry, carpentry, weaving, black smithery, cobblery, handloom, sugar mills, textile mills, gold smithery, barbers work, etc.
- If the modern industry is not present in a remote village/town then find out the industries in the nearest big town/ city.

Activity

- Revise the names of the occupations/industries from the past - make a chart as follows - use the examples from the Twelve Tradesmen (Balutedars) studied in the earlier activity.

Occupations /Industries in the past	Type of work	Pollution produced	Work done by labourers or machines

- Ask each student to come forward in the class and fill in the chart one by one.
- Now make another chart near this one on the board.

Current industry	Type of work	Pollution produced	Work done by labourers or machines

- Ask the students to fill this chart one by one and help them if required.
- Once both the charts have been filled, ask the students which type of industry is more detrimental for the human beings (both physically as well as mentally). Explain to them that the transportation is used on a large scale in the modern day industries and therefore it is necessary to include the pollution produced from transportation, in the modern industry types.

Objectives:

- To help the students understand that the occupations/industries in the past were sustainable in nature and produced very less pollution
- To help them understand that the present day industry creates a lot of pollution and therefore every product must be used carefully

41 Soil Erosion

Outdoor

Unit

Soil

Activity Duration

2 hours

Activity Month

January

Method

Field Visit, discussion

Material

Notebook, pen and measuring tape

Instructions for Teachers

- Identify a spot where soil erosion can be observed near the school. It can be a river or a stream bank, or a spot on the hills, or foothills, on the roads etc.
- Read the additional information given below.

Activity

- Ask the students the meaning of the term 'soil erosion'.
- Once they answer, explain that **the process in which the soil flows away with water or wind is known as soil erosion.**
- Ask the students if the soil in the surroundings of the school or near their homes has been eroded. Ask them to make a list of such places.
- Then take the students to the pre identified spots where the soil erosion was observed.
- Ask them the causes of the soil erosion at that spot and the factors due to which the erosion may increase.
- Explain the causes behind the soil erosion as per the additional information provided below.
- Then ask the students to come up with the solutions to stop the soil erosion.
- After the students propose the solutions, explain the remaining ones to them.
- Make them sit together and write the causes of the erosion and the possible solutions as per the chart given below in their notebooks.

Spot which has been eroded	Causes	Solutions

Additional Information for the Teachers

Causes of the Soil Erosion

The soil erosion is a natural process caused by the flowing rain water and wind. A soil particle is detached and displaced to a new location and millions of such displaced particles lead to the formation of the new landforms like the flood banks.

The soil erosion that occurs naturally happens very gradually and leads to the formation of the new landforms at the place where the erosion and the deposition occurs. However, the human intervention for various construction activities, especially done by using machines and the subsequent change in the landforms has led to an increased rate of the soil erosion.

Objectives:

To help the students understand about the soil erosion, its causes (both natural and man-made) and effects

- **Soil by the roadside:**
  - If a stream flows along a road, then the stream water carries away the soil by the roadside.
  - If a road has been constructed by cutting/ blasting a mountain or a hill, then such work exposes the lower soil levels and the rocks. The rain water and the vibrations created by the ongoing traffic leads to the soil erosion at such places.

- **Soil by the river bank or the stream bank:**
  - If soil by the river bank or the stream bank is excavated to construct houses, roads or for agriculture, it becomes loose and the flow of the water accelerates the soil erosion process.

- **Soil on the hills:**
  - Walking trails and paths for cattle which get created on the hills increase the rate of soil erosion.
  - If the hill does not have any trees or has very little green cover, then the soil on the hill can erode away due to loosening by the rain water or the wind.
  - If the land use on the hill is suddenly changed, i.e. it is used for farming or for constructing houses, then the soil becomes loose and can easily get eroded.
  - If pits and trenches are made improperly on the hills, then it can also lead to soil erosion.

- **Soil at the foothills:**
  - The soil at the foothills is used for multiple purposes: farming, construction of houses, etc. and this change in the soil profile can lead to erosion.

Solutions to stop the soil erosion:

- **Soil by the roadside:**
  - Ideally a road should not be constructed by a river/stream bank. But if it has to be constructed by the stream or river, then it should **be at a distance** from the stream/river. Large native trees should be planted in this space (between the road and the water body) so that the tree roots help in holding the soil.
  - If a road has been constructed by blasting a hill, then this exposed area has to be strengthened by building embankments such that this land or the material above it does not slide. Yearly maintenance of such embankments is essential for its longevity.

- **Soil by the river bank or the stream bank:**
  - The trees and vegetation along the river or stream bank help prevent soil erosion and so local native trees should be planted there.

- **Soil on the hills:**
  - If the land use of any place is suddenly changed, e.g. land use on a hill is changed from a forest to an agricultural land or for construction, the soil is bound to get loose. If this is to be reversed, then the original land form needs to be studied and accordingly an effort needs to be made to restore the land to its original condition.
  - If multiple gullies have been formed on the hill, make stone lines or construct a small bund. The length of such bunds and their location is decided according to the depth and slope of the gullies.

- **Soil at the foothills:**
  - Ideally such soil should not be rampantly excavated.
  - The soil erosion at the foothills can be prevented by building embankments and planting native trees.

42 Soil Conservation Techniques

Outdoor

Unit

Soil

Activity Duration

2 hours

Activity Month

February

Method

Work on site

Material

Measuring tape, tools for digging soil like shovel, sickle or trowel, small stones

Instructions for Teachers

- Identify a spot in or around the school campus, where soil restoration techniques can be employed. E.g. a small stream, a gully or a slope. Or select a part of a garden or ground in the school or open land near the school for this activity.
- These techniques may include constructing bunds, making stone lines, making trenches, constructing embankments, and the location selected should be appropriate for the same.
- Take proper care before lifting stones to check that there is no animal/ insect below them.
- If possible, take photographs of the work done by the students and display the photos in the exhibition at the end of the year.

Activity

- Tell the students that as they have seen the causes of soil erosion and the solutions to prevent it in the earlier activity, in this activity, they will be doing hands-on work to conserve the soil.
- Take the students to a location pre identified for the activity and ask them to collect small stones from the surroundings. Ask them to keep the stones together, and to stand in a semi-circle.
- Explain the following techniques of the soil conservation to the students and ask them to start working accordingly:
  - Small Stream -
    - **Stone bund** - if the site is near a stream where soil is getting eroded by the bank, ask the students what can be done to prevent the erosion. If students cannot answer, ask any two students to bring small stones and to place them one upon the other, across the stream from one bank to another.
    - **Embankment** - ask the students where a stone embankment can be constructed. Ask them how the stones should be laid for making the embankment and ask 6-7 students to make it. Ask them to place the bigger stones and rocks at the bottom and the smaller stones on the top.
  - Gully -
    - **Large stone bund** - if the site is a gully, ask them what causes such formations. Gullies are formed at some places due to the rain water runoff from the hills. Ask the students to make large stone bunds to prevent the soil erosion at such gullies.
  - Slope -
    - **Trenches** - Trenches are dug so that the soil on the slopes does not flow off. They are normally 5ft x 2.5 ft x 0.5 ft in size, but the width and the depth of the trench depends on the slope of the hill. Ask 3-4 students to dig a trench that is 3 ft x 1 ft x 2 inches in size so that they can have a trial of making trenches. Explain the method in which trenches are dug at staggered locations on the hill slopes.
    - **Stone lines** - explain to the students that at the places with a gradual slope, long stone lines are made to prevent the soil erosion - ask them to make such stone lines.

Objectives:

To help the students understand some simple ways of conserving the soil

Stone bund on the small stream

Stone embankment on the bank of the stream

Techniques of Soil Conservation

Stone lines on the slopes

Trenches on the slopes

large stone bund on the gully

43 Micro Climate

Unit

Climate and Weather

Activity Duration

1 hour

Activity Month

February

Method

Discussion, writing, observation, recording

Material

Thermometer, Hygrometer, notebook, pen, pencil

Instructions for Teachers

- Identify the following places for this micro climate activity, bank of a river/stream, shade under a tree, school campus, play-ground and a farm.
- Try to take the students to visit as many places mentioned above as possible.

Activity

- Ask the following leading questions to the students -
  - Does the climate in every class, or office in the school remain the same or does it vary?
  - Which areas are exposed to more sunlight and are therefore hotter?
  - Which areas are windier and is therefore a place where we feel cold?
  - Why does one feel cool when he/she stands under a tree on the school campus?
- Now write the name of this activity on the board and ask them the meaning of the words "micro" and "climate" and see if they can understand the concept.
- After they have answered, add the points that they might have missed and explain that when **a small area has a different kind of climate (hotter, cooler, drier or more humid) than the surrounding areas, then it is called a 'micro-climate'**. For example, it gets very hot on the school ground, whereas it feels cooler in the shade of a tree on the same ground.
- Ask them how they can measure the differences in the micro climates with the help of a few leading questions as follows:
  - How does one decide that it is warmer or cooler on a particular day?
  - Which changes in the air makes one sweat a lot?
- Now engage the students in a discussion and tell them that they will be using the thermometer and the hygrometer to make a few observations.
- Ask the students to make the following chart in their notebook and draw it on the board also. (Write the names of the pre-identified locations in the chart).

Location	Temperature (°C)	Humidity (%)
Classroom		
In the shade of a tree		
On the ground		
In the farm		
Under a large rock		
On the bank of the river or stream or on the seashore		
In the forest / thicket		

Objectives:

To help the students understand the concept of 'micro climate'

- Make groups of the students and take them to the pre-identified location. Ask them to take the readings of the temperature and humidity in their groups and write these observations in the notebooks.
- Once they have filled the above chart, ask them what inferences they can draw from it. Ask them to describe the difference between the micro climate in the classroom and in the shade of a tree. How does it feel at a lower temperature?
- Ask them to choose the location with the best micro climate according to them and the reason behind their choice.
- Now ask them which components if increased around the school and in the village/town/city can help to improve the climate.

Important note: at the end of this activity, check that the students have been collecting seeds as instructed. Remind the students to note the observations of the Sundial.

44 Agro-forestry Plan

Indoor

Unit

Agriculture

Activity Duration

1 hour

Activity Month

February

Method

Discussion, planning and presentation

Material

Notebook, pen, pencil, large plain papers, colour pencils and crayons

Activity

- Inform the students that they are going to prepare a plan for agro-forestry today. Explain to them that a 'forest' is a jungle of trees whereas a "farm" has cultivated crops or plantation. Engage them in a discussion around this topic and tell them that they are going to plan such a farm of trees.
- Now revise the following:
  - Trees found in your surroundings
  - Plants with medicinal values
  - Plants/trees planted on the hedges
  - Plants on the farm bunds/ periphery
  - Wild greens/vegetables
  - Forest food
- Write this list on the board.
- Now, ask the students to enlist plants under each of the headings/points with their uses.
- Provide a paper to each student and ask them to imagine that the paper given to them is their own land. Ask them to make a plan/framework of crops, trees, bushes, plants on the periphery or hedges that they will plant on this land.
- Ask them to take help from the lists made above.
- Check and discuss the plans made by the students and make changes if required.

Objectives:

- To enable the students to plan an outline for agro-forestry, using all the knowledge gained about the agriculture and plants from the earlier activities
- To help the students improve their planning and decision making abilities

45 Seed Exhibition

Indoor

Unit

Plants

Activity Duration

2 hours

Activity Month

February

Method

Exhibition, Discussion

Material

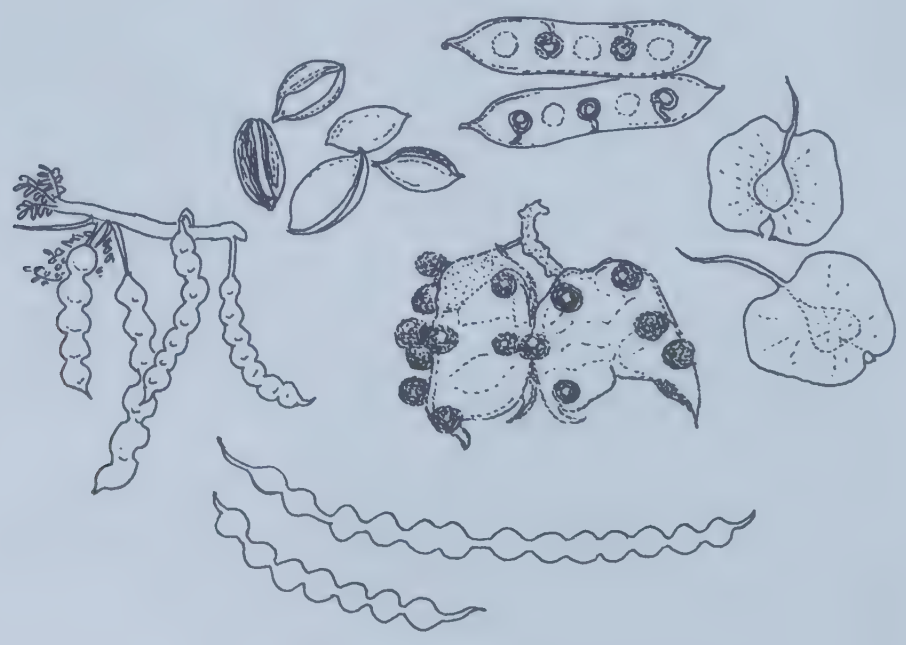
Notebook, pen, pencil, containers/seed holders made from leaves

Instructions for Teachers

- Ask the students to bring the seeds that they have collected as per the instructions given to them in the month of October.
- There should be diversity in the collection of seeds.
- Collect various rare varieties of seeds yourself if possible.
- Preserve the seeds carefully for displaying them again during the exhibition at the end of the year.
- If the exhibition planned for all the subjects is going to be held closer to this activity, include this seed exhibition in it as well.

Activity

- See the types of the seeds collected by the students and ask them some leading questions as follows:
  - Do all the seeds look similar?
  - Can they observe any difference in the colour, shape and weight of the seeds?
- Write their answers on the board.
- Explain the types of seeds based on seed dispersal, for e.g. seeds of trees like Arjuna (*Terminalia arjuna*) have wings which help them fly and disperse in nature with the wind. If such winged seeds are available, show them to the students.
- Most of the seeds have a protective layer covering the seeds. Explain the importance of the protective layer.
- Fruits or the pods of some trees have many seeds - ask the students to count these seeds, e.g. seeds of Indian Laburnum (*Cassia fistula*) tree.
- Now tell the students that an exhibition of the seeds is to be organized and their fellow students and teachers will be invited for the exhibition.
- Divide the class into groups and give each group a task.
- Here are some of the tasks for the exhibition:
  - Clean the place where the exhibition will be organized.
  - Keep the seeds in different containers/holders made up of leaves and arrange them in serial order
  - Make a label for each type of seed and add details like colour, shape, feel of the seeds to the label
  - Invite students and teachers for the exhibition
  - Write the details about the exhibition on the board.



Objectives:

- To help the students appreciate diversity in seeds
- To tickle the creativity of the students to organise an exhibition

46 Waste Treatment

Outdoor

Unit

Pollution

Activity Duration

2 hours

Activity Month

February

Method

Field visit, discussion, writing

Material

Notebook, pen

Instructions for Teachers

- Check how the waste management system works in your village/town/city – what are the processes or mechanisms employed for the same?
- Find information about any such waste processing plant or system in the nearby village/town/city. Try to get the following details:
  - Working hours of the plant
  - Permissions required for a plant visit for the school students (decide the date and the timing for the visit)
  - Information about what all can be seen during the visit.
  - Name and contact details of the official who will conduct the plant visit
- In villages where no such plant or system exists, the garbage is dumped at one location – take the students for the field visit to such a location.

Activity

- Revise the concept of Pollution, its types, causes and effects.
- Ask the students what is meant by "garbage" and how it gets generated. Once they answer, explain as follows. Anything that is thrown away into the surroundings at a large scale and which does not decompose naturally or takes a lot of time to decompose, is known as 'garbage'. Ask the students to write the above definition in their notebooks.
- Also ask them which type of garbage is observed near the school and their homes.
- Check if they know what happens with this garbage with the passage of time.
- Explain the purpose of today's activity and inform them that they will be visiting a waste treatment and processing plant today. Ask them to note down all the information that is given during the visit to the plant.
- Check that the official from the plant gives all the required information to the students and see to it that the points given below are discussed:
  - Which type of garbage is received at the plant?
  - From how many households or villages/settlements is it received?
  - What is the overall volume of the garbage?
  - Which processes are used to treat or dispose off the garbage at the plant?
  - What is the frequency of receiving garbage in the plant?
- If a 'Waste Processing and Treatment Plant' is not available near the school, this activity can be conducted in the class as follows:
  - Once the students have made a list of the types of garbage observed in their surroundings, ask them the manner in which it can be classified, E.g. wet waste, dry waste, decomposable waste – non-decomposable and hazardous waste, medical waste, etc. Write these types on the board.
  - Now ask the students how these different types of waste must be treated or disposed off.
  - If they cannot answer, ask them how the decomposable waste can be treated.
  - Draw a diagram as shown below and explain the decomposition of the wet waste.

Objectives:

To help the students understand nitty gritty of waste management and planning

- If a pit is dug and waste is added as the layers shown in the diagram, it will aid in decomposition of wet waste and produce 'compost':

- Ask them if they can imagine what happens to the non-decomposable waste, if they cannot answer, explain that the items made of materials like plastic are collected and sent to another plant for recycling.
- Waste from paper, cardboard, cloth, etc. are cut into very small pieces in a special machine and are either buried in the soil or are sometimes reused to make paper.
- At some places, all the above types of garbage are buried together in the soil.
- Now ask the students to try to think of how the waste water is handled – once they answer, inform them that the waste water is released into the rivers after treatment or sometimes without treatment. Explain the disturbances caused by this practice to the environment.
- Explain to them that there are waste water treatment plants in cities since the waste water in cities has a higher proportion of chemicals and this water is cleaned before releasing into the rivers.
- In some villages, the daily waste water which is produced after bathing, washing clothes and utensils is directly released into the kitchen garden and this nourishes the plants in the garden and the waste water from every home is directly disposed off on the spot. However, the cleaning agents have to be organic
- Ask the students what kind of changes can be made in the waste management at their homes and to write them in their notebooks.
- Underline the fact that the generation of waste/ garbage should be reduced in the first place.
- Ask the students to write all this information in their notebooks.

47 Best out of Waste

Indoor

Activity Duration

2 hours

Activity Month

March

Method

Hands on work, art

Material

Old newspapers, colours, colouring brush, crayons, water, 5-6 small utensils, glue (or library paste), 5-6 pair of scissors, images of animals, cardboard of old notebooks, waste wheat flour from the flour mill

Instructions for Teachers

- Check the methods of making various articles from the old newspapers.
- Collect old newspapers from the school.
- Also ask the students to collect and bring old newspapers.
- Preserve the objects made by the students for the exhibition.
- Avoid using material like cello tape, fevicol, stapler, instead use the biodegradable or reusable material like the library paste, pins and twine rope.

Activity

- Inform the students that they will be reusing the old newspapers to make various animals.
- Divide the class into groups of 5-6 students each and give the material mentioned above to each group.
- Ask them to spread a large newspaper on the floor and then cut small strips from the other newspapers.
- Now ask them to mix the wheat flour and water in a vessel to make a paste.
- Then show them images of various animals and ask them to choose an animal they like. Ask them to observe the image and make a model (of about 6-10 inches) with paper balls and cardboard.
- To make a model of an animal chosen by the students, they have to make a shape of the animal and its body parts with the help of paper balls - e.g. head, abdomen, tail, ears, legs and then paste all of it together with the help of the glue.
- Now ask them to stick small paper strips one upon the other, dipped in the wheat flour paste on this animal (taking care that the paste doesn't drip). Add three layers of these strips on the animal body, make the surface smooth without unevenness and leave the animal to dry.
- Once dried, colour the animal in detail.

Objectives:

- To help the students understand that waste can be reused, and old newspapers can be re-purposed to make useful articles
- To tickle the creativity of the students

48 Skit Performance

Indoor

Activity Duration

2 hours

Activity Month

March

Method

Dialogue writing, skit performance

Material

Notebook, pen

Instructions for Teachers

This activity is to be conducted in 2 hrs: 1 hour to be allocated for dialogue writing and 1 hour to be allocated for skit performance of about 5–10 minutes each.

Activity

- Divide the class into the groups of 6 students each and inform the students that every group has to perform an independent skit.
- Read out the introductory part of the story as given below to the students and ask them to complete the story in the form of a dialogue.

Story:

On a bright summer morning during their vacations, Sham and his friend Raj go hiking on the hillock in their village. On their way up, they notice various birds on trees and bushes, like the Bulbul, Warblers, Tailor bird, Drongo, Eagle, etc. It feels nice to hear the chirping and the melodious songs of the birds. They also can't stop admiring the trees of the Indian Coral tree and the Silk cotton tree in blossom.

Once the two friends reach the top of the hill, they sit under a large Banyan tree - many birds are creating a commotion on the tree and when they look up, they see various small and large birds, nests, squirrels, etc. Suddenly they hear some conversations - all the animals and the birds are having a chat with the tree:

Squirrel:

Drongo:

Banyan tree:

- Ask the students to imagine the dialogue of all the animals and the birds with the tree and write the dialogue – then ask them to write and perform the skit based on the dialogue.

Objectives:

To improve the creative imagination skills, writing skills, planning and teamwork of the students

Important note: at the end of this activity, check that the students have noted the observations of the Sundial and engage them in a discussion about change in the positions of the shadows as per the first activity.

49 Review 2

Indoor

Activity Duration

1 hour

Activity Month

March

Method

Quiz

Material

Notebook, pen

Instructions for Teachers

- Prepare a list of questions for a quiz. Select questions from those given below and add new questions based on the activities conducted after the Review 1.
- Reserve half the time for the quiz prepared by the students. The process and participation of the students is much more important than the number of questions they come up with.
- Ensure that all the students are present and participate in the review.

Activity

- Conduct a Quiz using the following questions.
- Divide the class into groups of 6-7 students.
- Ask them to sit with their groups and help them decide a name for their group - they may choose names of the flora/ fauna, for example, Orchid tree, Flame-of-the-Forest, Mango, Jamun, Deer, Tiger, Gaur, etc.
- Establish general rules for the quiz.
- Draw a score chart on the blackboard to note the points earned by each group.
- Questions like 'True or false', 'Fill in the blanks', 'Answer in one sentence' will get 1 point each and questions requiring a descriptive answer (questions with 'describe') will get 2 points.
- Ask each group to prepare quiz questions and to come forward and conduct the quiz.
- Thereafter, teacher can conduct the quiz as needed using the following questions:
  - What happens if the amount of the ground water reduces? Answer in 3-4 sentences.
  - How can the groundwater levels be replenished?
  - What causes the groundwater levels to deplete?
  - State whether true or false - Rice is cultivated in high rainfall regions.
  - How will you describe the climate of your region?
  - As per the climate of your region, which crops can be cultivated there?
  - How many months are there in the Indian calendar system and in the Gregorian calendar system?
  - Why was the Green Revolution introduced?
  - What are the damages caused by the Green Revolution?
  - How is the soil formed?
  - What is Micro Climate?
  - Can your "classroom" be considered as an example of a micro climate?
  - Name any 10 trees from the forest which you would like to plant near your house.
  - What causes soil erosion?
  - Name any four techniques of Soil Conservation. Sketch any two techniques on the board.
  - How many seasons exist in the Indian calendar system - name them.
  - Name the things you liked in the survey of the settlements.

Objectives:

To help the students revise the previous activities

- Name the things you did not like in the survey of the settlements.
- Name the 12 months as per the Indian calendar system.
- Name 7-8 components from the marine ecosystem.
- Define agro-forestry.
- What are the benefits of agro-forestry?
- Name any 10 seeds displayed in the seed exhibition.
- State whether true or false - 'Dam' is a traditional water management practice.
- Give any two examples of traditional water management practices.
- Solar energy, Nuclear Energy, Wind energy - pick the odd man out and state the reasons for your answer.
- What are minerals?
- In the current times, how many types of seeds are available in your region?
- Is there a dam near your village/town/city? Name it.

Reference Books for Additional Reading for Teachers and Students

(❀ Mark signifies that the book can be used by the students too)

- Amazing adaptations, Sukanya Datta, National Book Trust of India, New Delhi
- Among tigers and tuskers, Ramesh Bedi, National Book Trust of India, New Delhi
- Back to Nature, B.K.Trehan, National Book Trust of India, New Delhi
- Common Trees, H. Santapau, National Book Trust of India, New Delhi
- Elephant: Lord of the Jungle, Ramesh Bedi, National Book Trust of India, New Delhi
- Environmental Pollution, N. Manivasakam, National Book Trust of India, New Delhi
- Exploring the Biological World, Rohini Muthuswami, Sukanya Datta, National Book Trust of India, New Delhi
- Fishes, Mary Chandy, National Book Trust of India, New Delhi
- Indian Mammals a field guide, Vivek Menon
- Insects, M. S. Mani, National Book Trust of India, New Delhi
- Joy of Learning, Centre for Environment Education, Ahmadabad
- Jungle Trees of Central India, a field guide for tree spotters, Pradip Krishen
- Primer on Characterising Biodiversity, P.S.Ramkrishnan, National Book Trust of India, New Delhi
- Small Science, a series in Primary Science, Teacher's Book, Class 5, Developed by Homi Bhabha Centre for Science Education, Published by Oxford University Press
- Small Science, a series in Primary Science, Textbook, Class 5, Developed by Homi Bhabha Centre for Science Education, Published by Oxford University Press
- Social life of Animals, Sukanya Datta, National Book Trust of India, New Delhi
- Social life of Plants, Sukanya Datta, National Book Trust of India, New Delhi
- Textbook of Botany, First Year, B.Sc.
- Textbook of Geology, First Year, B.Sc.
- The ailing forests of India, C.K.Karunakaran, National Book Trust of India, New Delhi
- The environment education handbook, a teachers resource, Centre for Environment Education, Ahmadabad
- The Monsoons, P.K.Das, National Book Trust of India, New Delhi
- The Planet Earth, S.M.Mathur, National Book Trust of India, New Delhi
- ❀ Birds of Peninsular India, a pocket guide to 135 familiar birds, early bird and nature conservation foundation (available at BNHS)
- ❀ Birds of the Indian Subcontinent, Richard Grimmett, Carol Inskipp & Tim Inskipp, Oxford

- Butterflies of BNHS Reserve, a pocket field guide, BNHS and MMR Environment Improvement society
- Butterflies of Peninsular India, Krushnamegh Kunte, University Press
- Common Indian wild flowers, Issac Kehimkar, Bombay Natural History society
- Field guide to Indian Mammals, Vivek Menon, DK Delhi
- Field guide to Mangroves of Maharshtra, N. Vasudevan, Merwyn Fernandes, Mangrove cell, Maharshtra Forest Department, Mumbai
- Field guide to Marine Life of India, Deepak Apte
- Fishes of India, B. F. Chhapgar, Oxford University Press & WWF India
- Flowers of Sahyadri, Shrikant Ingalhalikar, Corolla Publications, Pune
- Further flowers of Sahyadri, Shrikant Ingalhalikar, Corolla Publications, Pune
- Insects of BNHS Reserve, a pocket field guide, BNHS and MMR Environment Improvement society
- Moths of BNHS BNHS Reserve, a pocket field guide, BNHS and MMR Environment Improvement society
- Seashore life of India, B.F.Chhapgar, Oxford University Press & WWF India
- The beautiful world of butterflies, Centre for Environment Education, Ahmadabad
- The book of Indian Animals, S.H.Prater, Bombay Natural History Society
- The book of Indian Birds, Salim Ali, Bombay Natural History society
- The book of Indian Butterflies, Issac Kehimkar
- The book of Indian Butterflies, Issac Kehimkar, Bombay Natural History Society
- The book of Indian Reptiles & Amphibians, J. C. Daniel, Bombay Natural History Society & Oxford University Press
- The book of Indian Shells, Deepak Apte, Bombay Natural History Society
- The book of Indian Trees, K.C.Sahni, Bombay Natural History society
- Trees of BNHS Reserve, a pocket field guide, BNHS and MMR Environment Improvement society

Reference Books for Additional Reading for Teachers and Students

Apart from the reference books and field guides we recommend light reading for the students and teachers from the regional languages and in English, some of the titles are - Children's books by Ruskin Bond and Jim Corbett, Dersu Uzala by Vladimir Arsenyev, The Yearling by Marjorie Kinnan Rawlings, Totto-Chan: The Little Girl at the Window by Tetsuko Kuroyanagi, Unstoppable Us- Volume 1 (How humans took over the world) by Yuval Noah Harari, among others.

Reference Websites for Environment Related Information

- www.arvindguptatoys.com/
- www.bnhs.org
- www.ceeindia.org/cee/publications.html
- www.cere-india.org/publications/
- www.grammangal.org
- www.hbcse.tifr.res.in/publications
- www.kalpavriksh.org/
- www.oikos.in/
- www.theecologicalsociety.org
- www.vigyanprasar.gov.in/digilib/
- www.wwfindia.org/news_facts/wwf_publications/

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- Pradeep Patade
- Sid Damale
- Sumant Pramanik
- Vinod Bartakke
- Vishal Jadhav
- Wikipedia and Wikimedia Commons

Condensed Module

If all the activities in the book cannot be conducted due to time or resource constraints, here is an outline of a condensed module, with half the number of activities. Titles of some of the activities have been changed and they are a combination of multiple activities as mentioned. For example, Introduction to Plants is a combination of activities 10,11,12 and can be conducted together.

Serial No.	Condensed Modules	Refer to Activity no.
1	Sun-dial	1
2	Favourite Foods of the Birds	4
3	Indicator Species	5
4	Forest Ecosystem: an Introduction	6
5	Mountain Ecosystem: an Introduction	7
6	Types of Forests	8
7	Forest in the Surroundings	9
8	India - Bio-Geographic Regions	11
9	Marine Ecosystem Part1	12
10	Mangrove Forest	13
11	Trees and Interdependence	Combine 15,16
12	Animals from India and around the World	19
13	Story Telling (Dodo)	20
14	Decomposers	21
15	Groundwater Reserves	26
16	Traditional Water Management	27
17	Plantation Planning in the Backyard	29
18	The Green Revolution	30
19	Minerals found in India	33
20	Season Cycle	36
21	Types of Renewable Energy	38
22	Soil Erosion and Conservation Techniques	Combine 41,42
23	Micro Climate	43
24	Seed Exhibition	45
25	Waste Treatment	Combine 46,47

About Oikos for Ecological Services :

Oikos for Ecological Services is working on ground in ecological restoration of landscapes since 2002. Some major areas of work have been in restoration, biodiversity conservation, propagation of native plant species, conserving soil and water and other natural resources management in the different parts of the country.

www.oikos.in

About Adhiwas Foundation :

Adhiwas Foundation is a non-profit organization founded in May 2018, registered under charity commissioner as a public trust. Adhiwas Foundation is established for filling the gaps in baseline as well as long term studies in the field of ecology, biodiversity, conservation, restoration, landscape level planning and nature education for both kids as well as adults.

www.adhiwas.org

About EFL Global :

EFL Global is a leading supply chain and logistics solutions provider that is committed to simplifying logistics for businesses through flexible, transparent, and future-ready solutions. With growing concerns about climate change, we have undertaken initiatives to ensure that we keep the best interest of our planet and its inhabitant at the core of how we work. We continuously enhance our sustainable standards through partnerships and voluntary memberships in global governing bodies and organisations. As members of the UN Global Compact and the Ethical Trading Initiative, we sustain the highest benchmarks of sustainable transportation.

www.efl.global